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RICE UNIVERSITY

Information and Leadership in Laboratory and Field

by

Carl M. Rhodes

A THESIS SUBMITTED
IN PARTIAL FULFILLMENT OF THE
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Doctor of Philosophy

APPROVED, THESIS COMMITTEE

Rick K. Wilson, Chairman
Professor of Political Science

T. Clifton Morgan
Professor of Political Science

Robert M. Stein
Dean of the School of Social Sciences
and Lena Gohlman Fox Chair
Professor of Political Science

David J. Schneider
Professor of Psychology

Houston, Texas

May, 1998
ABSTRACT

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An explanation of leadership within a particular class of institutions is developed. The institutions of interest are non-hierarchical, endow their leaders with few formal powers, and are hampered by principal-agent problems. The explanation proceeds in two stages.

First, game-theoretic models of leaders and followers engaged in two social dilemmas are developed. The models define leaders as the set of actors who can send cheap-talk signals to a group of followers. Leadership occurs when followers, recognizing that their chances of success without a leader are slim, choose to voluntarily accept a leader’s advice. The models highlight the importance of the underlying social dilemma, either a coordination or collective action problem, as well as the leader’s reputation for motive and competence.

Second, hypotheses are derived from the models and are tested under laboratory and field conditions. The experimental results demonstrate that leaders are remarkably adept at solving simple coordination problems, provided that followers have sufficient
confidence in the leaders' reputation for motive and competence. The effectiveness of leadership decreases, however, in collective action problems. In these settings, followers are often unwilling to take the risk that is inherent in following a leader's advice. Roll call data from the U.S. Senate are used to check if the experimental findings extend to a real-life setting. The data suggest that the models and laboratory evidence possess considerable levels of external validity.
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Chapter One
An Institutional Approach to Leadership

How do leaders lead? Why do followers follow? Why are some leaders successful in some situations, but unsuccessful in others? Although we have long recognized the importance of leadership in social and political interaction (e.g., Madison 1787), a solid conceptual hold on these basic and important questions has proven elusive. This weakness has not discouraged, however, a long-standing scholarly interest in questions of leadership. Leaders are central to many prominent accounts of economic firms, social and political groups, policy outputs, and political institutions, yet our understanding of the leadership dynamic remains incomplete.

In this chapter, I first sketch out the contours of the literature that is directly or indirectly related to questions of leadership. I argue that the literature may be divided into one of two broad categories. In the first category are studies containing theories and ideas that are about something else (e.g., political parties), but are nonetheless critically reliant on some conception of leadership. Because these studies rely on some notion of leadership, often poorly developed, the validity of these theories and ideas remains open to question. In the second category are studies that primarily are about leadership itself. This body of work has struggled to theoretically address the role of context.

In evaluating this work, I argue that the first body of literature would benefit from an improved understanding of the process of leadership within the institutional setting of interest. The second body of work would benefit from theoretical models of leadership
that explicitly emphasize the role of context in a systematic and theoretically motivated manner.

I then present an institutional approach to the study of leadership, followed by an overview of the theoretical models that will be developed in this study, as well as the reasoning behind the methodology employed to test the model’s predictions. I conclude with a preview of coming chapters.

The Ubiquity of Leadership

“Great necessities call forth great leaders.”

-Abigail Adams 1790, in a letter to Thomas Jefferson

It often is lamented that the scholarly community suffers from too many centrifugal forces, with each discipline and subfield engaged in a unique set of questions that permit little dialogue across boundaries. In general, this is probably true. But anyone reviewing the truly massive literature on leadership is struck not the by the academy’s disparate interests, but by the commonality of its questions. The ubiquity of leadership in scholarly accounts of economic firms, social groups, political parties, interest groups, and political institutions of all stripes is striking. Indeed, as social scientists of the late twentieth century, we might amend Ms. Adams’ statement to read “many necessities call for many leaders.” Across a diverse array of subfields, leaders often take center stage:
Economic Firms

Economic firms, ostensibly designed to combat a host of problems that plague less hierarchical and centralized settings, are nonetheless beset by a considerable set of problems of their own. Miller (1992) argues that the real purpose of firms is to endow one individual, a leader, with the opportunity to make symbolic gestures and costly commitments to the organization’s members in order to nurture the formation of trust and cooperation among the firm’s employees.


The Presidency

Much the same can be said of the presidency field. Beginning with Neustadt’s (1960) classic Presidential Power, scholars of the presidency have long focused their
attention on presidential leadership. Neustadt argued that presidential leadership, contrary to what might be assumed, is not about exerting legal force, but about political persuasion. Neustadt cautioned that presidents must hoard their political capital like so much gold, carefully dispensing it in order to persuade others that their interest and the president’s are one and the same. Edwards (1989) understood presidential leadership as facilitating change, while Rockman (1984) viewed the style of presidential leadership as a function of the interaction of two variables: political aggregation and political culture. Indeed, Neustadt, Edwards, and Rockman are hardly unusual in this regard. Many, if not most, studies of the presidency in some way speak to questions of leadership (e.g., Kernell 1986; Edinger 1964; Hargrove 1988; Neustadt 1980; 1990; Cronin 1975; Peterson 1990; Barber 1985).

Political Parties and Interest Groups

Leaders also are prominent in scholarly accounts of political parties and interest groups. Salisbury (1969) and Knoke (1985; 1990) argue that Olson’s (1965) challenges to group formation and maintenance are overcome in part by leaders, who offer packages of incentives to would-be members in exchange for durable commitments. Moe (1980; 1981) argues that a leader’s power goes beyond material selective incentives to include the ability to manipulate information: the extent to which members of the group believe that their contributions are or are not important. Walker (1991) views the function of an interest group leader as one of strategy selection, favoring an “inside” strategy under certain environmental conditions and an “outside” strategy under others. Panebianco
(1988) argues that not only are the decisions of leaders important in understanding party organization and organizational change, but that the competition to become a leader within the organization is vitally important as well.

Legislatures

Leading within legislatures, especially within the U.S. Congress, also has been subject to long-standing scholarly attention. Cox and McCubbins (1993; 1994; also see Aldrich 1995; Rohde 1991; Sinclair 1995; Rohde and Shepsle 1987; Wilson and Jillson 1989; Jillson and Wilson 1990; 1994; Kiewiet and McCubbins 1991) view the internal institutional structure of the U.S. Congress as a mechanism for the provision of public goods. Leaders stand at the center of this organizational apparatus: monitoring, rewarding, and sanctioning their followers to cooperate despite their strong incentives to shirk. An additional literature makes much the same case in a more traditional dialogue, describing the coordinating and cooperation-enhancing duties of leadership in terms of building coalitions, balancing factions, scheduling the floor, and collecting and distributing information (e.g., Ripley 1967; Jones 1968; Peabody 1976; Sinclair 1983; Canon 1989; Davidson 1989).

Policy Formation

The study of policy and policy formation has been focused on the study of leadership as well. Arnold (1990) argues that leaders determine which policies see the
light of day and which are buried in committee or on the floor. Schneider et al (1995) view policy outputs at both the federal and local level as largely a function of leaders-their motivation, and behavior. Baumgartner and Jones (1993), describing the complicated process by which an issue rises to the top of the national agenda, view leaders as crucial in their role of issue entrepreneurs.

*General Leadership*

Finally, there is a large literature that looks at leadership and leadership alone. Bass (1990) documented over 3,000 of these studies in *Bass and Stogdill’s Handbook of Leadership: Theory, Research, and Managerial Applications*. This literature has a long history, beginning in the 1930s with the search for a distinguishing set of psychological traits of leaders (e.g., Gibb 1947; Jenkins 1947; Stogdill 1948) and continued with an emphasis on leadership behavior in the 1950s and 1960s (e.g., Bales 1954; Kahn and Katz 1953). More recent work has included efforts to endow the trait literature (McClelland 1975; 1985; House 1977; Lord, Binning, Rush, Thomas 1978) and the behavior literature (Fielder and Garcia 1987; Graén and Uhl-Bien 1995; House et al 1987) with a theoretical foundation, and a debate over what constitutes “management” vs “leadership,” in which Burn’s (1978) famous work, *Leadership*, has been prominent (e.g., Bass 1985; Kousnes and Posner 1987).

Across an astonishing array of fields, leaders and leadership are center stage. Yet just as clearly, our conceptual grasp of leaders and leadership lags behind our frequent
emphasis. The massive body of work sketched out above can be divided into one of two categories. In the first category are those studies that are critically reliant on some notion of leadership in order to discuss something else. This category contains the literature on business and economic firms, the presidency, parties and interest groups, and legislatures. The literature that is primarily about leadership itself forms the second category.

The problem for the first category of literature is potentially severe. Much of this work relies on some conception of leaders and leadership as a component of their explanation of something else (i.e., the internal working of Congress, the formation of a group, etc.). Often, the use of leaders and leadership is a crucial link the chain of explanation, as the behavior or motivation of a leader stands at the heart of a theory or idea. Yet the understanding of how leadership works that is displayed in much of this work is at best incomplete, often inadequate, and in some cases completely absent. Because these theories are critically reliant on leadership, then, they remain open to question, as a key theoretical link is underspecified at best.

Consider, for example the following:

-Miller (1992) argues that the purpose of the firm is largely to nurture the formation of leadership. But he is vague on how, exactly, leaders perform their duties, suggesting only that they engage in symbolic gestures, credible commitments, and institutional engineering.

-Cox and McCubbins (1993) suggest that leaders lead as a result of the reelection motive, a valuation of majority party status, the power and prestige of the position, and the “internalization of the public good.” Yet they offer no clear model or conceptualization of the leadership process.
-Kiewiet and McCubbins (1991), although recognizing the importance of the principal-agent problem in the leader-follower relationship, offer no explicit analysis of its dynamic, save for acknowledging the importance of leadership selection and institutional rules in controlling principal-agent problems.

-Aldrich (1995) argues that parties are created to combat the problems of collective choice, collective action, and political ambition. Yet “parties” do not sanction, monitor, or cajole leaders. It is curious, then, that Aldrich neglects the dynamic of the leader-follower relationship, stating only that leaders are motivated by maximizing on an “instruction set” to take advantage of the institutional rules at their disposal.

The problem for much of this work, then, is straightforward: Critically reliant on leadership, it possesses little explicit theoretical treatment of its process. Because leadership forms a crucial link in the causal chain, it remains unknown if the integrity of the chain is sound, or if it is compromised by hazily formed assumptions and ideas. This literature would benefit from an increased theoretical understanding of leadership, especially if the heightened understanding explicitly described the settings to which it was relevant. If relevant, and with the addition of empirical evidence, such an addition would allow scholars to assess whether their assumptions about the leadership process are valid or in need of reconsideration, and what effect, if any, these changes would require in their broader explanation or theory.

The second category of literature, those works that explicitly address questions of leadership, would benefit from the development of theoretical models that explicitly incorporated the role of context. The literature in this category is massive, and broad generalizations often are unfair. Yet much of this literature has struggled with an inability
to connect a particular set of findings (i.e., a prominent trait or common behavior of leaders) with the underlying context in which it is found. Moreover, this literature has historically been conducted in an inductive and largely atheoretical fashion (for a review and discussion of this problem, as well as recent improvements, see House and Aditya 1997).

While one body of work related to leadership is critically dependent on ill-formed notions leadership for a crucial link in a causal chain, a second body of work has struggled to build theories of leadership that address the role of context. In this study, I contribute to both bodies of work by developing theoretical models that explicitly connect the leadership dynamic to the institutional setting in which it occurs.

An Institutional Approach to Leadership

The reason why scholarly interest in leadership is so widespread is because it is difficult to think of a group, institution, or organization that does not have a leadership position of one kind or another. This both an exciting and challenging proposition for the political scientist. It is exciting in that any study that increases our understanding of leadership is applicable to a diverse array of institutions and social environments. It also is challenging: how should we study leadership, given that its form and function vary greatly throughout the empirical world of interest? How should we study something that is present in the U.S. Senate, the local PTA, and (on rare occasions) the front office of the Minnesota Vikings football team?
In this study, my approach to leadership will be explicitly institutional in nature. I am interested in how leadership works within a broad class of institutional settings, and how the dynamic of leadership changes as we systematically alter particular features of that institutional context. It will be helpful, therefore, to begin with a brief discussion of the type of institution in which I am interested.

Examples of the institutional settings in which I am interested are common throughout social and political life, and include the full range of informal, voluntary groups and associations (e.g., neighborhood watch groups, citizen action groups, church organizations, etc.) and a wide range of political groups, organizations and institutions as well (e.g., campaigns, interest groups, legislatures, etc.).

These institutions are distinguished by three characteristics.

- First, they are decentralized (i.e., non-hierarchical). Unlike the U.S. Army, for example, in which there exists a clear hierarchy and chain of command, the institutional settings of this study are “flatter”: less centralized and more collegial. Each member is, more or less, “equal” in status to every other member and cannot “force” anyone do something that they do not wish to do.

- Second, leaders in these institutions are very constrained in what power they can wield. Leaders have few formal powers (i.e., sanctions or rewards) with which to compel follower behavior, and must instead convince followers to move in one direction or another through persuasion alone.

- Third, followers in these settings often are uncertain of whether or not they should offer a leader their trust. This uncertainty stems from the fact that institutional settings of this kind are rife with the well-known set of principal-agent problems (Alchian
and Demsetz 1972; Miller 1992; Kiewiet and McCubbins 1991). Due to the presence of incomplete information about a leader's true preferences, followers are uncertain about whether leaders have the followers' interest at heart, or an alternative and unwelcome agenda of their own.

In this broad category of institutions, scholars are presented with a number of interesting questions about the dynamic of leadership. How can leaders "lead" in decentralized settings, given little formal power, and a set of followers who harbor doubts about leaders' motivation? When is leadership possible in these institutions, and when is it not? Why do some leaders succeed at some times, yet fail in others? When will followers offer the leader their trust, and when and why will they withhold it? Within this broad category of institutions, what particular characteristics of the institutional setting contribute to or detract from leadership success?

In addition to providing the motivation for this study, these questions are of great interest to the two bodies of work discussed above. For scholars reliant on some notion of leadership to explain something else (i.e., those interested in small groups, political parties, interest groups, policy formation, political institutions, and even economic firms and the presidency, according to a growing number of scholars), the answers to these questions will inform a crucial component of their work. For scholars who examine leadership more directly, the answer to these questions will shed light on the process of leadership within a broad range of institutional settings, while at the same time explicitly connecting the leadership dynamic to the context in which it occurs.

Theoretical Models
This study consists of a number of game-theoretic models of leaders and followers in a decentralized institutional setting. The basic approach is to systematically vary some features of the model while keeping others constant in order to examine how the dynamic of leadership changes as the underlying institutional context is systematically altered.

Game-theoretic models are an ideal methodology for a study of this nature. First, they allow the analyst to take an extremely complicated subject (leadership), and simplify it in order to focus on a handful of substantively important factors. In the real world, the process of leadership is influenced by a wide range of factors, including personality, personal histories and relationships, and untold idiosyncratic features unique to a particular leader, time, or place. Game-theoretic models set aside many of these factors in order to highlight and better understand others. In this study, the factors to be highlighted are the institutional features surrounding leaders and followers in a decentralized context.

The models of this study develop four institutionally relevant components of the leadership process. Each of these components represents a particular feature of the broader category of institution to which this study is addressed. The four institutional features of the models are the underlying social dilemma, the tools at leaders’ disposal, the credibility of leaders, and the period of time in which leaders and follower interact. Below, I discuss each of these factors in turn.

*The Underlying Social Dilemma*
Social dilemmas refer to a wide range of situations in which individually rational behavior can lead to an outcome that makes everyone in the aggregate worse off (on social dilemmas, see Schelling 1960; Olson 1965; Hardin 1982; Dawes 1980; Schofield 1985; Oliver 1993; Ochs 1995; Ledyard 1995). The study of social dilemmas has become quite common in recent years, and includes the well-known cases of “the prisoners’ dilemma,” “chicken,” “the battle of the sexes,” and the “tragedy of the commons.”

In this study, I follow Calvert (1992) in arguing that leadership is productively examined through the use of social dilemmas. Calvert argues that leaders are created, and their power is derived, from their ability to solve social dilemmas for followers, and that the study of leadership is therefore best conducted within the social dilemma in which leaders and follower interact. Moreover, social dilemmas offer a number of advantageous features for the study of leadership. First, they plague many political, social, and economic settings of interest. Research employing social dilemmas is applicable to a wide range of settings, including groups, parties, and legislative institutions. Second, social dilemmas provide a single, unifying framework in which the dynamic of leadership can be explored. Rather than studying a particular set of leaders and institutions, the study of leaders within social dilemmas allows the analyst to vary a number of important parameters while retaining the generality of the findings. Finally, social dilemmas have been copiously examined, and provide the researcher with a considerable base of knowledge from which to depart.

In this research, I model leaders and followers interacting across two social dilemmas: a coordination game and a collective action game. Each may be thought of as a typical problem that actors face in decentralized institutional settings. Below, I give an
example of each drawn from a hypothetical legislative context, and then briefly review some relevant findings from the substantial literature that has developed around each game.

Consider the case of a legislative political party that contains three cohesive factions, A, B, and C. The party is faced with a choice of supporting one of three proposed bills, X, Y, or Z. To secure the passage of a bill, the party must unanimously support it. To divide its support is to ensure the failure of all bills. If no bill passes, the status quo remains, an outcome that the party strongly dislikes. Imagine further that the party’s members were indifferent between which bill passed; they care only that either X, Y, or Z pass over the status quo. Such a situation would closely resemble a coordination problem. What matters for the party is not which bill they support, but rather that they all support the same one. The trick for the party (and in coordination problems more generally) is to ensure that each member chooses the same option when all must choose simultaneously, and where communication is difficult or impossible.

Now consider an example of a collective action problem (and in particular, a binary collective good problem with a threshold). Imagine that the same party, with the same cohesive factions, would like to make a tough decision (reduce Medicare benefits in order to pare down the deficit, for example). For the measure to succeed, at least two of the three factions must make the tough vote. If only one faction votes to cut Medicare, but the other two do not, the bill fails, a disappointment to all factions. Further, if less than two factions support the measure, which ever faction voted for the unpopular proposal bears a stiff political penalty while forgoing the policy benefit of a reduced deficit. The social dilemma that faces a party here resembles a public good game with a
threshold, and the dilemma for the party is likely to be very different from a game of coordination. In collective action games with a threshold, the challenge is twofold: 1) convince enough actors to chip in to provide the good when each has an incentive to "shirk," and 2) determine who will chip in and who will shirk, given that full contributions from everyone are not required to provision the good.

A voluminous literature on both coordination and collective action games has sprung up over the past 30 years. No systematic attempt is made to review them here (for reviews, see Ochs 1995 and Ledyard 1995). Instead, I quickly touch on several key findings, as well as a number suggestions that have been advanced for "solving" these games.

The fundamental characteristic of a coordination game is the presence of multiple equilibria. In experiments, subjects have at times shown an ability to gravitate toward one of several Nash equilibria, but their ability to do so is critically dependent on the stationarity of subjects and choices, their experience, the payoffs both on and off the equilibrium path, and group size, among other factors. Moreover, although groups can coordinate under favorable circumstances, they often do not, leading scholars to ask what factors might contribute to the chances of success.

Several scholars have argued that spontaneous solutions to coordination games can emerge in the form of "focal points" (e.g., Schelling 1960). Schelling suggests that actors can use heuristics or obvious features surrounding the game to select a single (and optimal) strategy combination from a multitude of alternatives. Rabin (1994), however, while able to develop behavioral assumptions that allow actors to settle upon an equilibrium, describes the difficulty in modeling focal point strategies, and experiments by
Van Huyck et al. (1990), in which more than 70 percent of subjects neglected to select a pareto dominant focal point, call into question the ease with which actors will be able to employ Schelling’s solution.

Another approach, suggested by Farrell (1987), is to allow the actors to engage in “cheap talk”: pre-play, costless, non-binding communication. Absent an incentive to renege on their stated course of action in a coordination game, cheap talk offers the potential of enabling actors to gravitate toward a pareto-optimal equilibrium. In examining two-person coordination games, Cooper et al (1994) discover that cheap talk can be remarkably effective, allowing subjects to increase their rates of coordination from zero to 51 percent when only one subject signals and to 91 percent when both subjects signal. Yet the ultimate value of communication remains ambiguous (see Kerr and Kaufman-Gilliland 1994). The literature indicates that communication appears to be important in some environments but not in others.

There is an equally large literature on collective action games, particularly the type of collective action games of interest here: ones in which individuals choose to voluntarily contribute to a collective good, which is provided only if enough of the individuals chip in (e.g., Marwell and Ames 1979; Van de Kragt et al 1983; Rapoport 1984; Palfrey and Rosenthal 1984; 1988; Dawes et al 1986; Rapoport 1987; 1988; Rapoport and Eshed-Levy 1989; Isaac et al 1989; Rapoport and Suleiman 1993). A number of factors contribute to the likelihood of provision, including small groups, homogeneity, and a high valuation of the good relative to the cost of contributing. A number of institutional “rules” also increase the likelihood of provision, most importantly, communication, refunds, and “forced” contributions.
Theoretically, among the most important results is that the presence and content of actors’ beliefs is crucial to the outcome of the game (e.g., Rapoport 1984). Public good games with a provision point contain both the temptation to free ride as well as an inherent coordination problem: given that the contributions of only a subset of players are needed for provision, who should contribute and who needs not? Each player must formulate beliefs about whether her contribution is crucial to the good’s creation. Given the absence of a coordinating device, it is perhaps not surprising that the empirical rate of provision has varied widely across studies. Theoretically, in fact, such variance is roughly in line with expectations (see Palfrey and Rosenthal 1984).

In both collective action and coordination games, many scholars have argued that repetition, the repeated play of a single game, holds considerable promise for solving these social dilemmas (Taylor 1976; Axelrod 1984). In coordination games, actors can learn to coordinate their behavior over time. In collective action games, scholars argue that given a sufficient valuation of the future, actors will find the benefits of a long term stream of “cooperation” to outweigh the short-term gains achieved through “defection.” Kreps and Wilson (1982) show that this is indeed possible: actors playing dominated strategies are better off in certain variants of the collective action problem. The evidence, however, remains mixed. While Ostrom (1990) documents many natural settings in which actors eschew dominant strategies to defect, Isaac and Walker (1988) consistently find that actors fail to contribute fully toward the public good, and that the rate of contribution declines steadily over time.

Given the uncertainty associated with decentralized solutions (i.e., ones that are not “enforced” from above), many scholars have turned their attention to leadership as a
solution to social dilemmas (Calvert 1992; Cox and McCubbins 1993; Kiewiet and McCubbins 1991; Miller 1992; Rohde and Shepsle 1987; Sinclair 1995; 1992; Salisbury 1969; Rohde 1991; Jilson and Wilson 1994). In coordination games, it is argued that leaders, by establishing focal points, routines, and rules, can bring about the coordination and predictability unattainable by individuals acting alone. Faced with collective action problems, leaders can provide monitoring, selective incentives, and sanctions; enabling a set of individuals to reach and sustain a pareto optimal equilibrium path.

Yet recognizing the need for leadership is not synonymous with understanding its causal process. Although the literature makes an important contribution in identifying the pareto-enhancing value of leadership, it has generally neglected to specify the exact causal mapping of leader behavior onto follower strategies. This neglect is especially unfortunate in scholarly accounts of non-hierarchical settings such as the U.S. Congress (see Cox and McCubbins 1993), where leaders are severely constrained and followers ultimately are independent. In these settings, it is critically important to address the causal process: Why do followers follow their leaders when they are free to chart their own paths? Why are leaders followed in some circumstances but not in others?

Several scholars have attempted to address this problem by emphasizing leaders' abilities to monitor, reward, and sanction a set of followers (Frohlich, Oppenheimer, and Young 1971; Bender and Mookherjee 1987). Alchian and Demsetz (1972) argue that the ability to monitor and sanction subordinates is crucial in solving team-production problems (also see Holmstrom 1982). Calvert (1987) and Alt, Calvert, and Humes (1988) explain the dynamic of leadership as the process of establishing a reputation for the
ability to apply costly sanctions. Bianco and Bates (1990) develop a detailed model of a sanctioning leader, and establish a set of necessary conditions for leadership success.

But while the ability of leaders to sanction and reward is no doubt important in some settings, its ultimate value in explaining the process of leadership, especially leadership within the decentralized institutions of interest here, remains open to interpretation. Ostrom, Gardner, and Walker (1994) find that sanctioning is not a very useful institutional mechanism in and of itself. In the laboratory, the meaning of sanctions was “noisy,” and the mechanism proved incapable of moving subjects onto a pareto-efficient equilibrium path. Ellickson (1991) documents that sanctions are sparingly employed (both in frequency and severity) in a host of natural settings, while Rohde (1991) makes a similar case for the U.S. Congress. Oliver (1980) argues that the use of sanctions can backfire with feelings of ill-will. Wilson (1995), in a systematic test of the Bianco and Bates (1990) model, finds that even the most “endowed” leaders, those who could monitor and selectively punish individual followers, failed to significantly increase aggregate rates of cooperation.

This research, then, will model the dynamic of leaders and followers across two social dilemmas. In so doing, the models explicitly detail how the behavior of leaders affects the strategy selection of followers, and will conceptualize the leadership process with a realistic set of leadership tools, given a decentralized institutional setting. By varying the underlying social dilemma, hypotheses are derived (and evidence is gathered) that predict when and why leaders will succeed or fail.

Tools of Leadership
This research contains a very specific conceptualization of leaders, leadership, and the relationship between leaders and followers. Leaders are defined as the set of actors who are able and motivated to disseminate any information that affects outcomes through modifications in follower strategy selection\(^1\). Leadership, then, is the act and process by which leaders disseminate this information. Effective or beneficial leadership occurs when leaders, through the dissemination of information, encourage the selection of follower strategies that represent a pareto-improvement over what would be selected without leaders. Ineffective or detracting leadership occurs when leaders, through the dissemination of information, encourage the selection of strategies that are either 1) pareto-inferior to what would have been selected without a leader, or 2) indistinguishable from what would have been selected without a leader.

The tool of leadership (i.e., power) available to leaders in this study accurately reflects the tools that are available to most leaders in most decentralized institutional settings. Therefore, this feature of the models is held constant. What is of interest, then, is how the effectiveness of this power of leadership varies with the underlying social dilemma, the credibility of leaders, and the length of time over which leaders and followers react.

\textit{Leadership Credibility and Trust}

\footnote{Of course, in most settings of interest, institutional rules will be critical in determining which actors hold this position and ability (see Ostrom 1986).}
The third institutional feature critical for an understanding of leadership is a recognition of the importance of credibility. Many leader-follower relationships are plagued with the problems of agency (Alchian and Demsetz 1972; Miller 1992; Kiewiet andMcCubbins 1991). Individuals, faced with social inefficiencies, possess an incentive to delegate authority to a leader. The problem, however, is that leaders possess informational asymmetries over their followers and are able to engage in action that their followers cannot observe. These facets of the leader-follower relationship leave the followers vulnerable to “agency drift,” in which a leader works to create suboptimal outcomes for the followers (perhaps because the interests of the leader and follower diverge). Whether followers regard any information transmitted from a leader as credible, then, is highly dependent upon what they know about the leader and his or her motivation.

The role of credibility and trust is incorporated into the models of leadership through the modeling of leader-types. In the theoretical models to follow, followers know they have a leader, but are uncertain over what type of leader they have. Followers know that they have either a “good” or a “bad” leader. “Good” leaders’ interests are congruent with those of the followers, while “bad” leaders’ interests diverge from the followers’ interests in an (from the perspective of the followers) unwelcome direction. I will show that the type of leader in play, as well as the information that followers have about the motivation of their leader, are critical for an understanding of the dynamic of leadership.

The Extent of Interaction
The final institutional factor that shapes the contours of the leader-follower relationship is the presence or absence of repetition. When leaders and followers engage in repeated interaction, reputations can develop, punishments can be executed, relationships can spring up, and cooperative “tit-for-tat” behavior can be sustained. Without repetition, none of these factors come into play. The experimental evidence presented below not only sustains but qualifies these conjectures. The relationship between repetition and leadership is shown to be a delicate one, with the level of leadership success in the present highly dependent on events of the past.

In sum, the theoretical portion of this research develops a standard set of models and systematically varies their components. The models are then used to derive hypotheses, which are empirically tested using laboratory experiments and field data drawn from the U.S. Senate.

**Empirical Methodology**

Most of the empirical evidence gathered for this study is garnered from experimental data. Experiments offer the analyst a powerful tool with which to explore theoretically derived propositions in general, and offer an ideal method for testing game-theoretic models in particular (Campbell and Stanley 1966; Cook and Campbell 1979; Plott 1979; Kinder and Palfrey 1993). In the laboratory, such difficult to operationalize concepts such as “preferences,” “beliefs,” “information,” and “knowledge” can be precisely introduced, controlled, and measured, offering the analyst an unparalleled congruence between theory and test. Highly controlled experiments, such as the ones
employed here, achieve high levels of internal validity, providing unparalleled control for selection, maturation, testing, instrumentation, regression, and history threats (as well as most interactions). The result is that the researcher can be quite certain that a particular treatment (e.g., leadership) causes an observed outcome (e.g., improved follower-performance).

Further, experimental methods are a particularly appropriate methodology for a theoretical study of leadership. In the "real-world," there are a host of contaminating forces surrounding leaders and their behavior. Leaders might be more or less charismatic, have greater or fewer powers at their disposal than information alone, possess a positive or negative history with their followers, etc. Undoubtedly, all of these forces (and many more) are important to an ultimate understanding of leadership. But their premature inclusion serves only to muddy the waters, preventing an assessment of even a few important causal factors. In the laboratory, all these forces can be extracted away so that the analyst might focus on a set of important, if incomplete, causal forces that shape the dynamic of leadership.

Like all methods, however, experimental methods are not without weakness. Most of the drawbacks to experimental methods fall under category of threats to "external validity." External validity, referring to both problems of construct validity and to problems of generalization, cannot be guaranteed under laboratory conditions (Cook and Campbell 1979). It is desirable, therefore, to supplement experimental evidence with field data. If it is discovered that a set of models is robust to both experimental and field tests, the researcher can possess a reasonably high degree of confidence not only that the
theory is causally sound (internal validity), but also that at least some evidence suggests that it is causally sound across space and time (external validity).

The field data for this study will be drawn from the U.S. Senate. The Senate offers an excellent natural laboratory in which to study leadership in a decentralized setting, as senatorial leaders are severely constrained in the powers they are allowed to wield. Data on the roll call voting of senators are collected under one of two conditions: those with and without a "signal" from party leaders. If the theoretical models developed below have external validity, we should see distinct patterns across the two conditions, and as Chapter Seven shows, this is precisely what we observe.

Preview of Upcoming Chapters

Through theoretical modeling, and through the collection and analysis of both experimental and field data, this research improves our understanding of leadership within decentralized institutional settings. In so doing, this research contributes to both of the literatures reviewed above.

All theoretical and empirical results are presented in the next seven chapters. Chapter Two presents an overview of the experimental methodology employed in this study. Chapter Three begins the research in earnest with a presentation of a theoretical model and laboratory evidence of leaders and followers in a single-stage coordination problem. Chapter Four changes the underlying context to repeated coordination game. Chapter Five shifts the theoretical and experimental context again to a single-stage collective action problem. Chapter Six iterates the games of Chapter Five. Chapter Seven
turns away from the laboratory to consider leadership within the U.S. Senate, while Chapter Eight provides a summary and directions for future research.
Chapter Two

Overview of the Experimental Design

The experiments employed for this study required groups of eight subjects seated at personal computers in a single room. The subjects participated in highly structured decision settings in which they relied on computer-based instruction and interactions over a local-area network. Computer-based experiments provide enormous control over the environment in which subjects participate. This helps to satisfy claims about internal validity. Second, they simplify the implementation of a double-blind procedure in which neither the individual administering the experiment nor the subjects know which experimental manipulation they receive beforehand. Finally, they provide a low-cost way of conducting a large number of trials in a short period of time. As detailed below, this study involved hundreds of subjects participating in hundreds of distinct trials, yet each experimental session lasted a relatively short length of time.

Subjects were recruited from the student bodies of Rice and Texas A&M Universities, as well as the larger Houston community (mostly students of other Houston-area schools, such as the University of Houston). Subjects were recruited from large lecture classes, by responding to flyers posted around campus, and in student and local newspapers. Subjects only were told that the experiment was concerned with decision making, that details about the experiment would be provided when they arrived, and that they would be paid in cash at the experiment’s conclusion. These procedures served to limit the degree to which subjects believed they were participating in an
experiment about “leadership.” Such knowledge, a selection threat, could affect who decided to participate, as well as their behavior.

Cash payments were a vital component of the experimental design as well, and were designed to instill the proper motivation in the subjects (Plott 1979). Throughout the experiment, subjects made a number of decisions, earning a number of points for each one (which varied widely depending upon the “quality” of the subject’s decision and the decisions of those in group). At the conclusion of the experiment, subjects were paid privately in cash in an amount that reflected the number of points they had earned. The more points they had accumulated, the more cash they were paid. Cash payments were designed to motivate subjects to take their task seriously, as well as to limit boredom, both potential history problems. Subjects were privately paid to ensure confidentiality, and to make subjects feel that they could make whatever decisions they felt were appropriate at the time, irrespective of any perceived social considerations.

When subjects arrived at the laboratory, they chose their own seats at computer terminals. Like the airlines, I consistently "overbooked" the experiment in order to ensure that the minimum number needed for the experiment honored their appointment. In the event that too many subjects honored their appointment, I first asked for volunteers to leave, who were then compensated $3-5 and signed up for a future experiment\footnote{I conducted the experiments at two locations, Rice University and Texas A&M University. At the former, subjects who volunteered or were asked to leave were paid $3.00. At the latter, however, in order to conform to standard procedures of the Departments of Economics and Sociology, subjects were paid $5.00 when too many subjects arrived at the laboratory.}. In the event that not enough subjects volunteered to be "bumped," a randomizing device was used to select who would be asked to leave. They too were compensated and signed up for another experiment.
All terminals were separated by partitions so that subjects did not have a line of sight to one another's screens. This feature, designed to control for history effects, is especially important in the coordination experiments. If subjects were able to see one another's screens they might be tempted to engage in collusion and communication, both of which would be extraneous to the experimental treatments. In general, and to control for any threats to internal validity stemming from subject communication, all interaction among subjects was mediated by a computer system. Subjects were cautioned that they could not speak with one another during the course of the experiment, as doing so would result in its termination. No experiment was summarily ended for these reasons².

Once the requisite number of subjects appeared, they went through a short instructional introduction at their own computer terminal that consisted of text, extended examples, and a series of manipulation checks. Presenting the instructions and examples via the computer ensured consistency and reliability across both trials and subjects. Were this consistency lacking, instrumentation effects might have arisen, due to unavoidable variation in how a human being would read and present the instructions across time. The instructions and examples were self-paced and subjects were encouraged to ask questions prior to the beginning of the experiment. Ensuring that subjects understand their task throughout the experiment is vitally important. Care was taken to answer each question thoroughly as well as out-loud, so that all subjects could learn from the answer as well as be confident that no subject was receiving privileged information.

In this study, I am interested in how the dynamic of leadership varies with the underlying strategic context. Reflecting this concern, this study employed two general

² Although two experiments were cut short due to power or equipment failures.
types of experimental settings or “games”: Subjects either participated in a coordination game, or a discrete public good game with a threshold (which will be referred to as the VCM game, reflecting the “voluntary contribution mechanism” adopted for this study).

Regardless of which game they participated in, each subject was randomly assigned a letter-based identity at the outset of the initial round (which consisted of letters A, B, etc.), and then placed in a group. In single-shot games, the subject’s identity was randomly assigned at the beginning of each decision for the duration of the game. This feature minimizes reputational effects through which subjects might learn of each other’s past and likely future behavior over time, an obvious maturation problem. In the single-shot games, decisions are expected to be independent of order and absent any reputational cues. For the repeated games, subjects were randomly assigned a letter identity at the outset, and they maintained their identities throughout the course of the game. An important component of what makes a game repeated is that subjects know the identity of those with whom they play, and can learn of each other’s style as the game unfolds. Obviously, in this context, reputations can develop, and decisions are likely to be dependent across decisions.

For the coordination games, groups consisted of four people, while in the VCM games all eight subjects were in a single group. Four-person groups were appropriate in the coordination games because the number of people in the group is sufficiently large (relative to the number of choices) to embody the interesting theoretical properties of a coordination problem. Moreover, having two, four-person groups for each decision dramatically increases the number of observations per experimental session that can be collected in a fixed amount of time. During the single-stage coordination games, groups
were randomly reshuffled, along with the letter-IDs, at the outset of each decision. Again, this was to control for maturation effects that would arise from learning about the likely behavior of one's group over time. During the repeated coordination games, group composition, along with letter-IDs, as randomly determined at the outset of the game, and then held constant throughout. In this type of setting, reputational effects are an important and desired component of the design.

In the VCM games, eight-person groups were used in order to have a reasonable range (i.e., number) of contributions that were possible below the threshold (0-4), at the threshold (5), or above the threshold (6-8) necessary for provision. Such variation is not possible with four-person groups. In the single-stage VCM games, therefore, only the subjects' letter-IDs were randomized at the outset of each decision, while group composition remained the same. While I can be confident that subjects were unable to learn of each other's reputations as individuals over time, it is possible for subjects to learn of the group's aggregate behavior over time, even in the single-shot games (for more on this potential problem, see Chapter Five). For the repeated VCM games, letter-IDs were held constant after an initial randomized assignment.

Before making their decision, subjects were told about the experimental procedure, were informed about who was in their group, and were given instructions about any manipulations introduced in the upcoming decision. Manipulation checks were given at various points in the experiment to test whether subjects understood what they were doing.

In both the coordination and VCM games, the general task for the subject was to select a color. Associated with each color was a row payoff indicating that the outcome
was contingent on the color choice of one or more other subjects. Throughout the experiments, six different colors were used: brown, gray, orange, green, yellow and white.\(^3\) Colors were chosen to represent the available choices because they consist of neutral labels without any apparent ordering effects (important for the coordination games) or inherent meaning (important in the VCM games). In the coordination environment, colors represent the arbitrary choice set of a coordination problem—what matters is not the particular color chosen, but how many subjects choose the same color. If letters or numbers were used, subjects might employ norms of selection based on ordering (e.g., A before B, 1 before 2), which would make it difficult to assess to what extent subjects could coordinate with and without a leader by introducing an extraneous focal point around which subjects could structure their choices (i.e. an ordering norm).

In the VCM games, colors were selected as the object of choice rather than informing the subjects of their actual decision (i.e., offering or withholding their contribution from a public good, or investing in a private or public pool). Colors carry no inherent meaning or value. Contributing and shirking are actions with ethical and moral overtones, and informing subjects of the true nature of their choice would no doubt affect the criteria by which they made that choice. While norms of responsibility or group obligation are interesting, they are not the subject of inquiry here, which is to assess whether the introduction of a leader (and that treatment alone) will have an effect on the rate of contribution and provision. In the VCM games, therefore, one color was randomly

\(^3\) Initially the set of colors included red and blue. Pre-tests indicated that subjects automatically coordinated around these two colors. Brown and beige were substituted. Pre-tests showed that beige was very popular—probably because it was an odd color given the others, and served as a natural focal point. The set of colors finally settled on were robust to providing a natural, uncontrolled focal point.
assigned to represent the choice of contributing toward the public good, and the other was randomly assigned to represent shirking in each round.

At the outset of each decision, two (VCM) or three (coordination) colors were randomly chosen and presented to the subjects as the choices they had for that round. Additionally, these colors were randomly ordered at a subject's terminal for each decision period. Subjects were told that they would see the same colors, but were cautioned that the order of those colors might appear differently on the terminals of other group members. For example, while \{yellow, green, brown\} might be the order from top row to bottom row for one subject, another might see \{green, yellow, brown\}. This was done to control for positional norms that might develop in the course of the experiment (e.g., always pick the middle row). Subjects were told that it was the color that mattered, not position. Again, this control, like the random selection and rotation of colors in general, is designed to rule out alternative explanations that might be driving subjects' decisions.

Subjects made their choices privately and all choices were revealed simultaneously. Once everyone in the group had made a selection, subjects were informed of what the others had chosen and what they had earned for that decision (as well as what they had accumulated to that point). Additionally, the appropriate cell in the payoff matrix was highlighted to reinforce the result. After all subjects had reviewed this information, subjects moved on to the next decision.

For each decision they made, subjects accumulated points (for the coordination games) or “experimental francs” (for the VCM games). In the coordination games, points were converted into dollars using a Roth-Malouf procedure (Berg et al 1986), while in the VCM games, experimental francs were converted into dollars at a fixed rate, which was
announced to subjects prior to the first round. Details on these procedures can be found in the appropriate chapters.

Experimental sessions varied considerably in length, ranging from 45-120 minutes. Some sessions consisted of only one game, whereas others consisted of two or three games (e.g., a single-stage coordination game followed by a repeated VCM game). If more than one game was presented, care was taken to keep each game relatively short to prevent fatigue and boredom. Further, the order of the games for the sessions in which more than one game was played was randomly determined. Average earnings for the experiment varied greatly depending on whether the experimental session was a “short” session (i.e. one game) or a “longer” session (i.e., more than one game). In general, earnings averaged around $7-10 per hour, a sum which seemed quite salient to the subjects, judging from the number of subjects who wished to sign up for future experiments.

The “macro” design of this study may be thought of as a 2x2x2x3x2 incomplete factorial design\(^4\). Comparisons are made on both a “within-subject” and “between-subject” basis. In the former, the decisions of a given subject under various conditions are compared with one another. In the latter, comparisons are made across subjects who may or may not have participated in the same conditions.

The first factor described the nature of the game that subjects played. Accordingly, all subjects participated in either a coordination or VCM game. As discussed above, this manipulation was not always randomized. Most of the coordination data were gathered from subjects who only participated in a coordination

\(^4\) Note, however, that this is not the design of a particular experiment, but the overall design employed by
game. All of the VCM data, however, were gathered from subjects who often participated in coordination games as well. If so, the order in which these games was presented was randomly determined\textsuperscript{5}.

The second factor builds on the conjectures about the importance of repetition. Subjects participated in either single-shot games or repeated games. In the single-shot games, all subjects received a new letter identity at the start of each decision. Further, subjects were randomly assigned to a new manipulation at the outset of each decision that may or may not have included a new manipulation or role (i.e., in the first decision, a subject might be a leader acting under uncertainty. In the second decision, the same subject might be a follower acting under uncertainty). Finally, in the coordination environment, subjects were assigned to a randomly composed group for each new decision. In repeated games, subjects maintained the same letter identity, the same group, the same role, and experienced the same manipulation throughout the game.

The third factor directly explored the dynamic of leadership. Accordingly, all decisions either had a leader or did not. Under the no-leader manipulation the group was made up of four, symmetric (i.e., non-hierarchical with no role or task distinctions) subjects in the coordination games and eight symmetric subjects in the VCM games. Each individual made a private color choice and all choices were revealed after everyone had

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\textsuperscript{5} In general, these decisions were largely the result of circumstance, reflecting the availability of subjects, and the timing of the completion of the theoretical models and computer programming.

It should be noted that the analysis reported in the following chapters includes tests of the comparability of data that were gathered under varying experimental sessions. For example, in the single-shot coordination chapter, analysis determined that there was no significant difference between data from a coordination game in which the order of the manipulations was randomized and data from a coordination game in which the order of the manipulations was not randomized. All such analysis is discussed below under the appropriate chapter.
chosen their colors. In this setting, a subject’s payoff was dependent on his or her own choice as well as the choices of others.

Under the leadership manipulation, one subject from the group was randomly selected to be the leader. That member was referred to as the “monitor” -- a more neutral term than “leader,” and the followers were referred to as “participants.” Although Hoffman and Spitzer (1985) argue that special endowments granted to a subject should be “earned” before they are salient for a subject, this did not appear to be a problem in these experiments. The “leader” only was asked to transmit a signal. As with followers, the leader’s payoffs were tied to the group’s decisions. Rather than being assigned a special property right, leaders simply were assigned to a position that involved little disparity in status.

Once selected, the leader began the game by sending a private signal to each follower suggesting a particular color. The signal was nothing more than a suggested color and was sent via the computer. Once followers observed the leader’s signal, they made their own choice, and were always free to accept the leader’s advice or ignore it. Followers were paid on the basis of their own choice as well as the choices of other followers. In the coordination setting, a leader’s payoff was a function of what the followers chose as well as what she selected. In the public good setting, leader earnings only were a function of what the followers chose.

The fourth factor pertained to the likelihood of having a particular "type" of leader in the experiment. The use of "types" is common in one-sided signaling games, where the party without information has probabilistic information about which kind of player she is facing, and its introduction allows the analyst to explore the role of reputation in the
leadership dynamic. The first type of leader was referred to as a "Type W" monitor. The interest of Type W monitors were congruent with the "good" leaders introduced in chapter one. A second type of leader was called a "Type Z" monitor and always had an incentive to send misleading signals to subjects (i.e., the "bad" leader). In conditions where they had a leader, subjects were told the probability that they would draw one of these types of leaders. Factor three manipulated the probability of obtaining a Type W monitor: either a Perfect probability of 1.0, a High probability of .85 or a Low probability of .50.

Leaders always knew their type and were provided with a single payoff matrix reflecting that type. If the probability of a good leader was lower than 1.0, subjects were given two payoff matrices, one assigned to each type of leader. The type of leader was only revealed following the joint decision by all followers in the group.

Finally, the fifth factor varied the credibility of leaders. Under conditions of certainty, leadership signals always were credible. Under uncertainty, the credibility of signals was randomly determined\(^6\). The credibility of leadership signals under uncertainty is a joint function of the payoffs and the probability associated with having each leader type.

Having provided an overview, I will now turn to theoretical models and experimental results themselves. In each of the next four chapters, I will complete the description of the experimental design previewed above, in addition to deriving theoretical

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\(^6\) The credibility of leaders was always randomized in the public good games. Some data on the coordination environment are drawn from experimental sessions in which the credibility of leaders is not fully random. As before, analysis was performed to ensure the appropriateness of pooling the data. This analysis is discussed below under the appropriate chapter.
models of leadership in a decentralized setting. I then derive a number of predictions from the theoretical models. Finally, I compare these predictions with the experimental results.
Chapter Three

Leaders and Followers in a Single-Stage Coordination Game

In 1984, the members of Republican party of the U.S. Senate wanted to do something about the federal deficit. Ostensibly, the task should have been straightforward as nearly all of its members, the majority party, wanted a deficit-reduction bill to pass. The task, however, was significantly more difficult than it first appeared. The Republican party was an extremely heterogeneous lot in both opinion and ideology, and dozens of distinct proposals were advocated by its members. Worse yet, the leadership of the Senate was endowed with few rules with which to restrict access to the agenda, which meant that individual members were largely free to bring their varied proposals to the floor. As the Winter months faded into Spring, the party veered toward paralysis. United in their desire to act, party members were divided over which policy proposal to endorse.

Bob Dole of Kansas, the Republican leader, seized upon a single alternative: Cut defense spending by $17.7 billion, and freeze the COLA allowance for Social Security. Presented with a singular focal point, and after considerable cajoling from the leadership, the party rallied around Senator Dole’s Proposal. At 1:30 a.m. on May 9, Senator Dole rounded up 49 votes, and with Vice President Bush’s tie-breaking vote, Dole’s proposal enabled the party to act.

Coordination problems, such as the Republican struggle to reduce the deficit, are ubiquitous in social and political settings. As a group, the Republicans held a common objective, but due to the presence of multiple means to a single end, they were at risk of
failing to achieve their common goal. In this chapter, I ask whether leadership, as an institutionally imposed solution, can ameliorate this common problem.

**Coordination Problems**

The strategic problem that the Republicans faced, and the one that will be of interest throughout this chapter, is presented in Figure 3.1. Here, two factions of the Republican party are choosing between two policy options, G and R. To pass a bill (and get the "big payoff" of 2), both factions must endorse the same policy. Which particular policy the factions endorse is irrelevant. What matters is that both factions endorse the same proposal. Each policy constitutes a Nash equilibrium in that once selected, neither faction has a unilateral incentive to change.

<Figure 3.1 About Here>

This setting is typical of coordination games in which there are multiple equilibria, and while disarmingly simple, this problem constitutes a considerable social dilemma. Coordination is unlikely given that the game has multiple equilibria, actors make simultaneous choices, there is no pre-play communication, and the game is played only once.

Now consider a more general treatment of this game, \( \Gamma_1 = (C) \). Let \( C = \{c_1, c_2, \ldots, c_n\} \) in which n actors choose a particular c, where \( c \in \{\alpha, \beta, \ldots, \kappa\} \).
Assume there are \( k \) such elements. The strategy space is given by \( \Pi\{\vec{c}_1, \ldots, \vec{c}_n\} \) with each \( \vec{c}_i \) representing the vector of choices \( \{\alpha, \beta, \ldots, \kappa\} \).

Let the payoffs for this game be given by equation (1), where \( f(\bullet) \) is some monotonic increasing function and \( \sum c_{ji} \) is a simple counter.\(^1\)

\[
U_i = f\left( \sum_{j=1}^{n} c_{ji} \right)
\]

(3.1)

with \( c_{ji} = \begin{cases} 1 & \text{if } c_i = c_j \\ 0 & \text{otherwise} \end{cases} \).

The \( i \text{th} \) actor's payoff is conditional on the number of times her choice, among \( k \) elements, matches the choices by others. This strategic context defines an \( n \)-actor matching game. Choices are made simultaneously and in private.

In this game there are \( k \) Nash equilibria. These equilibria may be thought of as the strategy vectors \( \{c_1^*, \ldots, c_i^*, \ldots, c_n^*\} \) in which all actors choose exactly the same element.

Proposition 3.1: The strategy vector \( \{c_1^*, \ldots, c_i^*, \ldots, c_n^*\} \) is in equilibrium.

Suppose that the strategy vector \( \{c_1^*, \ldots, c_i, \ldots, c_n^*\} \) is selected and all but the \( i \text{th} \) actor has chosen the same element (for example, \( i \) selected \( k \), while all others selected \( b \)). Once the outcome is announced, if given a chance, \( i \) would unilaterally...

---

\(^1\) It is assumed that the \( i \text{th} \) actor always matches herself. This means that at a minimum there is one match, and at a maximum there are \( n \) matches.
change her strategy to $c_i^\ast$. By playing $c_i$, $\sum_{j=1}^{n} c_{ji} = 1$, whereas by switching to $c_i^\ast$,

$\sum_{j=1}^{n} c_{ji} = n$. Clearly $f(n) > f(1)$ and the $i$th actor would choose to switch.

Likewise it is easy to see that if the strategy vector $\{c_1^\ast, \ldots, c_i^\ast, \ldots, c_n^\ast\}$ was played, no actor ex post unilaterally would choose $c_i$. To do so would be to earn the outcome $f(1)$.

Because the payoffs from this game are symmetric, there is no pareto ranking over the Nash equilibria (for an example of a game with pareto rankings, see van Huyck et al., 1990). In the absence of a pareto superior alternative, each of the equilibria is equivalent. Much like the problem of the Republicans trying to pick one bill to unanimously support, the problem for actors in this game is to coordinate on a single choice, a task that is not as simple as it may seem. In fact, absent an institutionally imposed solution, coordination in this game is very unlikely.

Now consider a second game $\Gamma_2 = (C, S)$ that grants specific powers to one of the actors. That actor, a leader, is able to costlessly and privately signal to each follower a suggested choice. As before, each actor makes a choice, privately and simultaneously, in a matching game. In this setting, however, a leader sends a private signal given as $S = \{s_1, s_2, \ldots, s_n\}$. If the leader's interests are congruent with those of the followers, and the leader sends the same credible signal to all followers, full coordination is achieved in equilibrium.
The payoffs in this game are identical to those in the first. The only distinction is that the leader can signal a suggested strategy to others. All actors (including the leader) prefer to coordinate on the same choice, but are indifferent to which choice that is.

To understand the strategic concerns in this game, consider the role of signals from the leader’s perspective. First, the leader will send the same signal to each follower. The signal either will be obeyed or will not. If there is a one-to-one mapping from signal to choice \((S \rightarrow C)\), then the leader’s payoff is maximized when everyone selects the same element. There are \(k\) different vectors of signals that the leader could send, each mapped onto the \(k\) equilibria in choices. The leader has a dominant strategy to send the same signal to all actors.\(^2\)

Proposition 3.2: \(\{s_1^*, \ldots, s_i^*, \ldots, s_k^*\}\) is an equilibrium signaling strategy where \(s_i^* = s_j^* \forall i, j\).

Suppose followers do what the leader suggests. Suppose that the leader picks a signaling strategy \(\{s_1^*, \ldots, s_i^*, \ldots, s_k^*, \ldots, s_n^*\}\) in which all \(s_i^* = s_j^*\), except for the \(k\)th individual. The leader sends that individual a different signal. Suppose that all followers obey the leader and pick the element suggested. If the leader picks \(s_i^*\) then her payoff is \(f(n-1)\). \textit{Ex post} the leader would switch her strategy to \(\{s_1^*, \ldots, s_i^*, \ldots, s_k^*, \ldots, s_n^*\}\), because, if all followers obeyed the signal, then the leader would earn \(f(n)\), which is greater than \(f(n-1)\).

\(^2\) There also exist a finitely large set of correlated equilibria. For example, if the leader sent all followers the signal \(\alpha\), they could all choose \(\beta\), and so on. However, the mechanism enabling actors to settle on correlated equilibria in a single play of the game is very unclear. I ignore this possibility in the discussion.
Proposition 3.2 assumes that followers obey the leader's signals. In Proposition 3.3, the credibility of these signals is explicitly considered.

Proposition 3.3: In \( \Gamma_2 = (C, S) \) a leader's signal is credible if \( s^*_i \Rightarrow c^*_i \).

Given complete information about the leader's payoff function, i's beliefs are that a leader will choose what the leader signaled. As a consequence, i obtains \( f(2) \) at a minimum, since his choice and that of the leader will match. But suppose the leader chooses something else instead. This leaves \( u_i = f(1) \) at a minimum. But this implies that the leader has decided she can do better by matching another follower(s). At a minimum, this implies the leader's payoff will be \( f(2) \) -- that is, the leader matched at least one other follower. But the leader could have been better off by sending a signal to i, matching the signal to j, and obtaining a payoff of \( f(3) \). Consequently, the leader has an incentive to ex post change her signal.

More generally, if i is sent a different signal, then at a maximum the leader's payoff is \( f(n - 1) \). But this means the leader could have increased her payoff by giving i the same signal. At a maximum, this would result in a payoff of \( f(n) \). In this instance a follower can conclude that inconsistent signals hurt the leader as well as followers. By extension, the follower can assume that leaders will send credible signals.

Let us return to the Republican party to illustrate the dynamic introduced by leadership. Suppose the game is given in extensive form by Figure 3.2. In the first move of the game, the Republican leader sends a signal to a group of her partisans, Faction 1--
in this case to support either the G or R bill. That faction chooses either G or R and the leader is not informed of its action (hence the information set for the leader). The leader next sends a signal to Faction 2. As is clear from the second and third information sets (given by circles and squares at each of the nodes), Faction 2 makes a choice without knowing the leader's signal to Faction 1 nor Faction 1’s selection. This, of course, lies at the heart of the coordination problem.

<Figure 3.2 About Here>

If the leader's payoffs are common knowledge and are based on the actions of followers, then the leader's signal is credible. Consider how Faction 2 interprets a signal from the leader (and suppose the leader suggests that the Faction choose bill G). It knows that the leader has sent a signal to the first Faction. It also knows that the leader's incentives are compatible with its own. Even though Faction 2 does not know Faction 1's choice, it knows that in order for the leader to gain the big payoff of (2,2,2), she would not deliberately mislead both Factions by sending mixed signals. Therefore, it assumes that the leader has sent the same signal to the first Faction. As such, the second Faction can do no better than follow the leader's signal. The first Faction considers the leader’s signal in a similar fashion. It too knows that although it cannot observe the second signal, it is not in the leader's best interest to send mixed signals and risk getting the small payoff of (1,1,1). Therefore, the first Faction will heed the signal, certain that the leader will give the same signal to Faction 2. Mixed signals are never in the leader's best interest in this
case. Both the leader and the Factions know this, and in this sense these "cheap talk" signals are credible.

$\Gamma_2$ demonstrates the value of leadership. Faced with a potentially debilitating coordination problem, followers trust the counsel of their leader because they know that the leader is "on their side." Based on this common knowledge, leaders enable their followers to optimally solve an otherwise formidable social dilemma.

In most environments, however, there is some uncertainty about the commonality of interest between leader and follower. The third game, $\Gamma_3 = (C, S, p)$, highlights this dynamic by adding uncertainty about a leader's type. As before, a leader is empowered to send signals to followers. But instead of having interests that are congruent with the followers, there is some probability, given by $p$, that the leader's interests diverge from those of the followers. This introduces a different "type" of leader. From the standpoint of followers, one might conceive of the former as a "good" leader, while the latter is "bad." The probability of a "good" or "bad" type is common knowledge.

By adding leader types, I explore the role of credibility -- a crucial factor in many leader-follower relationships. In the second game, leader signals always were credible, whereas in this game the credibility of leaders is at issue. As before, I assume that a good leader's payoffs are congruent with those of the followers (i.e., the more followers who choose what the leader chooses, the higher the leader's payoff). The introduction of a bad leader changes the payoffs in the game. The payoffs for all actors under a bad leader are given in equation 2, where $f(\bullet)$ is some monotonic increasing function and $\sum c_{j|i}$ is a simple counter as before.
\[ u_i = f\left((n + 1) - \sum_{j=1}^{n} c_{ji}\right) \] (3.2)

This is a peculiar coordination game -- a game in which none of the actors, including the leader, wishes to choose the same element from \( C \). The more times an actor matches others, the less that is earned. There are two problems with this game. First, if \( k \) (the number of elements in \( C \)) is less than \( n \), there are some elements that will be chosen more than once. Therefore, not every actor can look forward to obtaining a maximum payoff. Second, and more importantly, the leader's signal may no longer be credible.

If followers know with certainty that they have a bad leader, then that leader's signal cannot be credible. To see this, consider Lemma 1.

**Lemma 1.** A bad leader's signal is not credible.

Suppose a bad leader sends the signal \( \{s'_1, s'_2, \ldots, s'_n\} \). If all followers obey the signal, each will earn:

\[ u_i = f\left((n + 1) - \sum_{j=1}^{n} c_{ji}\right) = f((n + 1) - (n - 1)) = f(2). \]

This is because the leader will choose something different from the followers, thereby guaranteeing a maximum payoff of \( f(n) \) for herself. The remaining \((n-1)\) followers will each match \((n-1)\) times and end up with a minimal payoff. By unilaterally switching his choice, a follower increases his payoff to at least
\( f(n - 1) \) (if matching the leader's choice) or \( f(n) \) (otherwise). As a consequence, followers have no incentive to listen to a bad leader's signal.

Knowing that he is facing a bad leader, what should a follower do? Lemma 2 points out that a follower's best response is to play a mixed strategy.

Lemma 2. A follower's best response to a bad leader's signal is a mixed strategy.

With a bad leader, each follower wants to minimize \( \sum_{j=1}^{n} c_j \). With choices made independently, each individual makes a draw from \( k \) choices, with some probability of drawing a particular \( c_j \). The joint probability of all choices can be represented as a multinomial probability in which

\[
p_j = \text{the probability of a particular } c_j \text{ being chosen},
\]

\[
\eta_i = \text{the number who have selected a particular } c_j, \text{ and}
\]

\[
\sum_{j=1}^{k} \eta_j = N.
\]

The multinomial distribution is given by:

\[
\frac{N!}{\eta_1! \eta_2! \ldots \eta_k!} p_1^{\eta_1} p_2^{\eta_2} \ldots p_k^{\eta_k}
\]

For a particular \( c_j \) the expectation under the multinomial is given as \( N p_j \).

In order to ensure that expectations over each \( c_j \) are equivalent implies that \( N p_1 = N p_2 = \ldots = N p_k \). Because \( N \) is fixed, then each of the \( p_j \) must be equal.
This means that $p_i = \frac{1}{k}$. As well, the expected number of common choices for any $c_j$ will be $\frac{n}{k}$.

Lemmas 1 and 2 point out that from the perspective of followers, a "bad" leader is no leader at all (or at least not a leader they want to follow). Leadership, then, can positively or negatively affect a follower's fortunes. What matters is the similarity of leader and follower interest and the common knowledge that surrounds it.

Finally, suppose that a follower does not know with certainty what type of leader is in play. All the follower knows is the distribution of leader types in the world. In many ways, this game can be considered as one in which nature makes the first move by choosing a leader and that choice is not revealed to the followers. Followers only know that good leaders are drawn with probability $p$ and bad leaders with probability $(1-p)$.

Followers have two things to consider. First, they have expectations for obeying the leader's signal. In such a case, a follower's expected payoff is given by equation 3.

$$[(f(n) \times p) + (f(2) \times (1 - p))]$$ (3.3)

The first term represents i's payoff if everyone follows the signal and nature draws a good leader. The second term is i's payoff if everyone except the leader follows the signal and nature has drawn a bad leader. Second, followers also have expectations for not obeying the signal and playing a mixed strategy. The expected payoff for a follower is given by equation 4.
\[
\left[ f\left(\frac{n}{K}\right) \times p \right] + \left( f\left(n + \frac{1}{K}\right) \times (1-p) \right). 
\]

The first term is the payoff for playing a mixed strategy and having a good leader, while the second term is the payoff for playing a mixed strategy and having a bad leader.

Proposition 3.4. A leader is credible at a knife-edged value of \( p \).

Suppose followers are risk neutral and that they have expectations over payoffs. So long as \( \left[ f(n) \times p \right] + \left( f(2) \times (1-p) \right) > \left[ f\left(\frac{n}{K}\right) \times p \right] + \left( f\left(n + \frac{1}{K}\right) \times (1-p) \right) \), subjects will use a leader's signal, even though they are uncertain about the leader type. Rearranging terms, if \( p > \frac{f\left(\frac{(n-1)k}{k} + k\right) - f(2)}{f(n) + f\left(\frac{(n-1)k}{k} + k\right) - f\left(\frac{n}{k}\right) - f(2)} \) then

subjects will gain more by following the leader than by ignoring the leader's signal in expected value.

The above expression, although inelegant, is commonsensical. The numerator takes the difference between the best that a follower could expect from a good leader when playing a mixed strategy and the worst from a bad leader when obeying the signal. The denominator takes the sum of the best payoff from a good leader and subtracts the sum of the worst payoff for a bad leader when either obeying the signal or playing a mixed strategy.
The problem for a follower, then, is to assess the type of leader. This only can be derived from common knowledge about the distribution of types of leaders and the payoffs associated with each type.

The next several sections empirically assess these different coordination games. The chief concern is with the effect of leadership. Following a brief discussion of the experimental design, specific predictions are offered. Finally, data are presented that are explicitly linked to the different coordination games discussed above.

**Experimental Design**

The experimental design employed in this chapter emulates the one-shot coordination games discussed above. The design has two primary components. First, subjects participate in four distinct decisional settings. These are labeled below as the "conditions" of the experiment. The second component involves a series of manipulations. These factors are discussed here. The general experimental design is a 2×3 incomplete factorial design. The first factor builds on conjectures about leadership in coordination games. Under the no-leader manipulation, the group was made up of four members, each of whom made a private choice of a particular color from a list of three alternatives. All choices were revealed after everyone had chosen, and in this setting, a follower's payoff was dependent on the choices of other followers.

Under the leadership manipulations, the group included four members, one of whom was randomly selected to be the leader for that round. The leader sent a private signal to each follower suggesting a particular color choice. The signal was nothing more
than a color and was sent via the computer. Once followers observed the color suggested by the leader, they made their own choices. Followers were paid on the basis of the number of followers choosing the same color in order to reduce follower confusion about the role of the leader. A leader, on the other hand, earned points that were a function of what the followers chose as well as what she selected.

The second factor pertains to the likelihood of having a particular "type" of leader in the experiment. The first type of leader was referred to as a "Type W" monitor. Such a leader always had strong incentives to send a coordinating signal to subjects. A second type of leader was called a "Type Z" monitor and always had an incentive to send misleading signals to subjects. In conditions where they had a leader, subjects were told the probability that they would draw one of these types of leaders. Factor two manipulated the probability of obtaining a Type W monitor: either a perfect probability of 1.0, a High probability of .85, or a Low probability of .50.

Leaders always knew their type and were provided with a single payoff matrix reflecting that type. Subjects were given two payoff matrices, one assigned to each type of leader. The type of leader was only revealed following the joint decision by all followers in the group. An example of the payoff matrices is discussed below under the condition four experiments.

*Experimental Conditions*
Subjects participated in five distinct conditions in the experiment, although only the results from four of the conditions are discussed here. In each condition, subjects made a number of group decisions. Before beginning each new condition, subjects were given new instructions and, where the new condition differed markedly from the previous, subjects were taken through an extended example.

Condition one of the experiment involved individuals playing five single-shot, two-person games. Condition one was designed to familiarize subjects with the mechanism used in the experiment, introduce them to strategic conditions more generally, and illustrate how they earn money in the experiment. All decisions in condition one involved conditions with dominant pure strategies.

Condition two of the experiment is a coordination game involving four subjects participating in a series of one-shot games and choosing among three colors. The more subjects who chose the same color, the more points a subject earned. Subjects privately and simultaneously chose colors and were not allowed to communicate with one another, making the coordination problem quite difficult. Condition two serves as a baseline for estimating the amount of coordination that occurs without leadership.

Figure 3.3 provides an example of the screen that subjects faced in condition two. While all subjects in the round saw the same colors, the row position of these colors was randomized for each subject. Once a subject made her choice, the row was highlighted and she was asked to confirm that choice. Once all choices were made, everyone's choice was revealed to the right of the matrix. The points earned, total points, and total possible

---

3 In the fifth stage of the experiment subjects were given a social-psychological manipulation concerning their leader's personality trait. These results concern an entirely different form of behavior and are not included in the discussion here. Since this manipulation was introduced last or randomly mixed in with the others (see appendix), it has no effect on the results discussed here.
points also were displayed. Finally, the cell corresponding to the group choice was highlighted. Following the decision, subjects were randomly reshuffled into new four-person groups and were presented with parameters for a new condition.

<Figure 3.3 About Here>

Condition three introduces a Type W leader under certainty. In this setting, the leader sends a private, "cheap talk" signal to each follower. Three subjects serve as followers and a fourth subject is randomly chosen as the leader. The leader privately signals to each follower a color that might be selected. No follower knows the signal received by others. The signal constitutes "cheap talk" in that no individual is bound to follow the leader's suggestion. Once a signal is sent, followers and the leader then choose a color. As in condition two, payoffs are a function of how many subjects choose the same color.

In this setting, all leaders are good leaders. That is, their incentives match those of the subjects. The more followers who choose the same color, the higher both the followers' and leader's point total for choosing that color. To reduce confusion about the status of the monitor, followers view a matrix denoting payoffs for choices made only by followers, while the leader has a matrix representing all members of the group. Otherwise, the screens for the leader and the followers look similar.

Condition four is similar to the third except that two types of leaders are introduced: good and bad. The leader's type is not revealed to followers. They only know the likelihood that they have one type of leader or another. Good leaders have
incentives that are identical to the leaders in condition three. Bad leaders, however, have interests opposed to followers. It is in the interest of the bad leader to choose a color that others have not chosen. Figure 3.4 depicts a follower's screen and payoffs for this setting. Followers observe two matrices, each representing their payoffs as a function of their leader's type. Attached to each matrix is the probability of getting that type of leader. Both matrices constitute a coordination problem--the "bad" leader condition is simply a reverse coordination condition in which followers want to select different colors. Moreover, under the good leader condition, leaders are motivated to assist followers, whereas under the bad leader condition, follower and leader interest diverge.

<Figure 3.4 About Here>

As with condition three, a leader sends a signal to followers. The problem in this setting is whether the followers can trust that signal. Once the signal is sent, followers and the leader choose a color. Choices then are revealed in the same manner as in previous settings. The appropriate cell is highlighted in the correct matrix for each subject. It is at this point that the type of leader is revealed to all followers.

At end of five periods (for data collected at Rice University) or the experiment (for data collected at Texas A&M University), cash payoffs were generated using a Roth-Malouf procedure (Berg et al 1986) in order to control for the unobserved variation in subjects' risk orientations. Each subject made a number of decisions, and for each decision they accumulated points. At the end of the five rounds or the experiment, subjects were told the percentage of total points that they earned and then were presented
with a lottery between a large prize and a small prize. The more points they earned, the more likely they were to win the large prize.

The lottery at the end of a round was quite simple. A subject was asked to draw from a deck of 100 cards which ranged in value from 1 to 100. These cards were electronically displayed on the subject's computer screen and appeared to the subject face down. When a card was drawn, its value was revealed. If the value shown on the card was less than or equal to the percentage of points the subject accumulated, the subject earned the "big" prize. If the card's number was larger then the percentage of points the subject accumulated, the subject earned the "little" prize.

Predictions

I offer a number of predictions derived from the theoretical discussion detailed above. The first prediction focuses on the condition two trials in which there is no leader to coordinate follower actions. The prediction is straightforward:

Prediction 3.1. Subjects will fail to coordinate on a particular equilibrium.

Coordination rates will reflect a base rate equivalent to subjects employing a mixed strategy.

The second part of this prediction presents the null hypotheses for condition two. Because there are four subjects in a group choosing among three colors, even if they use their mixed strategy, they will occasionally converge on the same colors. The
independent probability of matching two, three or four other subjects, assuming mixed strategy play, is given as \{2 : .449, 3 : .442, 4 : .109\}

The second prediction turns to introducing a leader into a simple coordination game. This leader has the same interests as followers have, and, in the terminology used above, is commonly referred to as a "good" leader. This is the case in the condition three trials.

*Prediction 3.2a.* In a simple coordination game with a known "good" leader, followers will coordinate in their choices.

Rates of coordination should be 100 percent. A weaker prediction depends on comparative statics, simply that followers will coordinate far more often with a leader than without one. If we focus on follower behavior (ignoring the leader's choice), then the probability that three followers select the same color is easily calculated. If subjects ignore leader signals and play a mixed strategy, then the distribution of three individuals picking the same color is \{1 : .666, 2 : .297, 3 : .037\}. This distribution serves as the null hypothesis for conditions three and four.

*Prediction 3.2b.* In a simple coordination game with a known "good" leader, followers will coordinate at higher rates than without a leader.
The third prediction is derived from Proposition 3.2, and is integral to leaders providing a coordinating role.

\textit{Prediction 3.3}: A leader will choose an equilibrium signaling strategy of sending the same color signal to each follower.

The expectation here is that leaders will send the same color to each follower. As followers only see their own signal, this constitutes the only piece of coordinating information that is available.

The fourth prediction is derived from Proposition 3.3. In the condition three trials, subjects know that their leader is a good leader. Consequently, the leader's signal is credible and followers have an incentive to match the signal. Followers should never deviate from the leader's signal.

\textit{Prediction 3.4}. Followers will match the leader's signal when they know the leader is a "good" type.

The fifth prediction is derived from Proposition 3.4 and turns to the condition four trials. Here, followers are uncertain about their "type" of leader. The key is whether the probability of getting a good leader is sufficiently high to make the signal credible or not. Credibility is dependent on the payoffs and probabilities attached to each decision.
*Prediction 3.5a.* In a coordination game with an uncertain type of leader, coordination will occur when a leader's signal is credible

Because individuals rarely calculate precise probability thresholds in their heads, I also offer a simpler prediction:

*Prediction 3.5b.* In a coordination game with an uncertain type of leader, coordination rates will be higher when subjects’ beliefs about having a good leader are higher rather than lower (e.g., in the .85 trials rather than in the .50 trials).

This weaker prediction points to subjects roughly estimating their chances for having a good leader. While subjects may not calculate the exact probabilities, they will respond in systematic ways to the levels of uncertainty introduced here.

Lemma 2 leads me to predict that when a leader is not credible, subjects will revert to playing a mixed strategy. Consequently Prediction 3.6 is related to predictions 3.5a and 3.5b. If followers revert to a mixed strategy, then coordination will fail.

*Prediction 3.6.* Followers play a mixed strategy when their leader is not credible.

Finally, Prediction 3.7 holds that a leader's equilibrium signaling strategy is a pooling equilibrium for good and bad leaders alike. That is, a bad leader will signal the
same color to every follower, just as a good leader will. The difference, of course, is that a bad leader will then pick something different than what was signaled, with dramatic implications for follower payoffs.

*Prediction 3.7.* A "bad" leader will send the same signal to each follower.

**Results**

Condition one was designed to familiarize subjects with the structure of the experiment. Subjects were randomly paired and played a game with a unique equilibrium in pure strategies. My results show that subjects settled on that equilibrium. In 64.17 percent of the trials, subjects jointly played their pure dominant strategy. Although there is obviously some “noise” and a learning effect that is visible in the data, Table 3.2 shows that subjects were increasingly likely to settle on the equilibrium with practice. The table reports the percentage of pairs selecting the equilibrium by round in condition one of the experiment.

<Table 3.1 About Here>

My real interest lies in the outcomes from condition two. In this stage, four individuals are involved in a pure coordination game. Prediction 3.1 proposes that subjects will fail to coordinate their color choice. Indeed, this seems to be the case.
Overall, in 134 trials subjects chose the same color only 19.4 percent of the time. Table 3.2 compares the expected rate of coordination if all subjects play their mixed strategy equilibrium and the actual rates of coordination. While subjects infrequently manage to fully coordinate, they do better than expected. Under a Chi-square test I find that the actual rate of coordination differs from the null hypothesis ($\chi^2 = 8.51$, df=2, p<.05).

<Table 3.2 About Here>

There does not appear to be any systematic reason for these higher rates of coordination. The composition of the group and subject identities were randomized prior to each decision. So too were the colors and their positions. Even so, subjects might have concentrated on either position or color. Additional analysis rejects the idea that subjects favored one row position over another. Examining the 536 choices made by subjects, the top row was selected 38.6 percent of the time, the middle row 34.7 percent and the bottom row 26.7 percent of the time. While there is a weak tendency to choose the top row, this does not hold up under a Chi-square test assuming that any row is equally likely to be chosen.

Subjects did focus on one particular color. Three colors were randomly chosen for each decision and subjects observed those colors in randomly assigned row positions. Table 3.3 reports that subjects favored Green and they neglected Brown and Gray at rates distinguishable from a null hypothesis specifying that subjects picked colors with the same frequency with which they were provided by the experimenter. While this null can be rejected at the .05 level, participants had a difficult time achieving even modest levels
of coordination. Absent any leadership mechanism, subjects found coordination to be elusive.

<Table 3.3 About Here>

*Coordination With a Leader.*

The strong version of Prediction 3.2 expects that when leaders are able to send a coordinating signal, coordination will be automatic. The weaker version of this prediction expects significantly higher rates of coordination than that which occurs in condition two. Table 3.4 presents the results. First, I find that full coordination is not automatic, falling short of 100 percent. However, these results are substantially different from what are obtained under the condition two trials where full coordination was achieved only 19.4 percent of the time. In the condition three trials, a leader increases the overall coordination rates to 79.7 percent. Importantly, these results are significantly different from the expected percentages if followers simply used a mixed strategy.

<Table 3.4 About Here>

These findings are reinforced by examining the behavior of individual leaders and followers. Prediction 3.3 suggests that a leader has an equilibrium signaling strategy in which the same color is sent to all followers. The data show that leaders understand the importance of their signals. They sent all three followers the same color signal 95.8
percent of the time. This provides very strong support for prediction 3.3. In turn, followers accepted the leader's advice: followers heeded the leader's counsel at a rate of 92.4 percent. This evidence, combined with the behavior of leaders and the dramatic increase in coordination rates, suggests that cheap-talk leadership can be quite powerful if followers have sufficient confidence in the leader's motivation.

*Leader Types and One-Sided Signaling*

What if followers lack this confidence? Condition four introduces uncertainty about the type of leader to explore this dynamic. Prediction 3.5a claims that credible signals can be transmitted even when there is uncertainty concerning the type of leader, while Prediction 3.5b offers a weaker version of that hypothesis. There is only weak support for the strong prediction. While the rate at which followers obey the leader's suggestion is higher with a credible leader than without (77.4 percent and 72.0 percent respectively), the difference is substantively small. This small improvement in obeying the leader is reflected in the differences in coordination between groups with and without a credible leader. As Table 3.5 shows, groups with a credible leader do marginally better than groups without ($\chi^2=3.41$, df=2, $p<.2$), but the effect is substantively small at best.

<Table 3.5 About Here>

Such findings suggest that subjects do not finely discriminate among theoretically derived thresholds. Prediction 3.5b offers a weaker assessment focusing on the
manipulation of probabilities. By looking at the low (.50) and high (.85) probability manipulations, we can see whether subjects are sensitive to the theoretical concerns with credibility and its impact on the effect of leadership.

Table 3.6 produces the percentage of color matches in groups, broken out by the probability of getting a "good" leader. Overall, subjects are sensitive to uncertainty. Rates of full coordination drop from 79.7 percent in the stage three trials to 38.8 percent in stage four. This drop in coordination, however, is not uniform across the leader probability manipulation.

<Table 3.6 About Here>

When a good leader is likely to be chosen only half the time, the full coordination rate drops to 27.3 percent. When a good leader is likely to be chosen 85 percent of the time, the full coordination rate climbs to 50.0 percent. A Chi-square test of the difference between these two manipulations strongly supports the idea that they take on different meanings for followers ($\chi^2 = 17.74$, d.f. = 2, $p < .001$).

Prediction 3.6 sheds light on the way in which followers respond to the signals of leaders. It contends that if a leader's signal is credible, then there ought to be a match between the leader's signal and the follower's choice. Subjects react quite differently to the high and low probability manipulations. Under the .85 manipulation, 83.8 percent of followers follow the leader's suggestion, while only 68.7 percent of followers choose a leader's suggested color under the .50 manipulation. This reinforces the findings in 3.6: In assessing a leader's suggestion, subjects are sensitive to not only the presence of uncertainty, but to the magnitude that uncertainty as well.
Table 3.7 more directly addresses Prediction 3.6. It tabulates, for each group, the number of subjects choosing what the leader signaled. For purposes of comparison, the first column is the expected distribution if followers ignore the signal and use a mixed strategy. There is a significant difference across the high and low probability manipulations ($\chi^2 = 17.78$, d.f. = 3, $p < .001$). Under the .85 manipulation, 61.8 percent of the groups always obey the leader, while approximately half that (33.3 percent) do so under the .50 manipulation. And although the distribution of choices under the low probability manipulation does not resemble a mixed strategy distribution, it is far removed from looking like a distribution that matches a leader's signal.

<Table 3.7 About Here>

What of a bad leader's behavior? Prediction 3.7 claims that a bad leader will look exactly like a good leader in that both will send the same color to all followers in the group. Table 3.9 provides the distribution of signals sent by types of leaders. Leaders are broken out by whether they were good (Type W) or bad (Type Z). Leaders could either signal three different colors, two different colors, or the same color. In 87 of 91 groups, good leaders chose the equilibrium signaling strategy of sending the same color to followers. By comparison, this happened in just 23 of 43 groups for the bad leaders. Even more surprising is that almost a third of the time bad leaders sent three different colors to followers. There is no advantage to this because if followers obey their private signal, the leader will match at least one follower, thereby reducing her payoff. These findings fail to support Prediction 3.7.
Uncertainty about a leader's type can markedly affect the impact of leadership. Subjects are neither capable of making fine distinctions across levels of probability, nor do they precisely recognize the thresholds at which leader signals remain credible. Yet followers are sensitive to the manipulation of the likelihood of getting a "good" leader. I find important comparative statics differences across the levels of leadership probabilities. As expected, as those probabilities decline, so too do rates of coordination.

Discussion.

Not surprisingly, subjects found decentralized coordination games to be extremely difficult. Consistent with Prediction 3.1, less than 20 percent of the groups coordinated their choices absent a leader. More importantly these data show that the presence of a benign leader dramatically improves subjects' performance. Although subjects did not perfectly coordinate under a good leader (Prediction 3.2a), they did achieve marked pareto improvements, coordinating at a rate of 79.7 percent. Leaders proved helpful by sending the same signal to all followers over 95 percent of the time (prediction 3.3). Followers, meanwhile, followed suit, obeying the signal of a good leader over 92 percent of the time (Prediction 3.4). The major finding, then, is that leaders, wielding only cheap-talk signals, can significantly improve the lot of followers in their charge in this particular setting.

As an institutional solution, however, leadership is not without its limitations. Its benefits rapidly decline in the face of uncertainty about the motivation of leaders.
Although subjects proved incapable of finely discerning the credibility of their leader (Prediction 3.5a), they did make intuitive adjustments, offering their trust under more favorable reputations (the .85 manipulation) and withholding it under others (the .5 manipulation; Prediction 3.5b). Under the “low” probability manipulation, subjects clearly were hesitant to follow a leader’s suggestion (Prediction 3.6). This behavior was not without good cause. Although bad leaders did not always execute their optimal strategy (Prediction 3.7), they nonetheless acted in ways that were quite distinct from “good” leaders, being less than half as likely to send the same signal to followers.

Clearly, leadership can be important for resolving coordination problems. Leaders can serve as a focal point, helping followers choose one, from among several, equilibria. It is this coordinating role that makes leadership especially valuable in many contexts in which followers are largely autonomous and independent of leadership. So long as followers have reason to trust their leaders, coordination problems are simply solved by a cheap talk signal, the very tool that leaders are most likely to possess.

If followers lack this trust, however, the effect of leadership quickly can be lost. I began this chapter by describing the success of Bob Dole in enabling the Republicans to pass a deficit reduction package. In light of the theoretical model and experimental evidence presented here, it seems plausible to suggest that the engine of Bob Dole’s success, given his limited power, was the intersection of the tools at his disposal, his reputation, and the context in which he worked. Dole’s fellow Republicans probably believed that absent leadership, the probability of success was slight, and that given their belief that Dole’s interest was congruent with their own, the risk of following his advice was justified.
In the next chapter, I deepen my examination of cheap talk by altering the underlying context. By varying the social dilemma, we can begin to discern the potential and limits of this tool of leaders, as well as the informational, strategic, and institutional mechanisms that contribute to or attenuate its success. As we will see, leadership in a coordination problem changes dramatically when an additional feature, repetition, is added to the underlying strategic context.
Figure 3.1
Coordination Game with Two Factions
Figure 3.2
A Leader and Two Factions

Leader

Fact 1

Fact 2

Leader Information Set

Follower Information Set
Figure 3.3  
Condition One: A Standard Coordination Game

Your Earnings Based on  
Number of Others Choosing Same Color:

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orange</td>
<td>10</td>
<td>50</td>
<td>80</td>
<td>100</td>
</tr>
<tr>
<td>Yellow</td>
<td>10</td>
<td>50</td>
<td>80</td>
<td>100</td>
</tr>
<tr>
<td>Green</td>
<td>10</td>
<td>50</td>
<td>80</td>
<td>100</td>
</tr>
</tbody>
</table>

Choose One:
- Orange
- Yellow
- Green
- OK
Figure 3.4:  
Example of a Follower's Screen for Condition Four Trials

Your Earnings Based on  
Number of Others Choosing Same Color:

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orange</td>
<td>4</td>
<td>7</td>
<td>29</td>
</tr>
<tr>
<td>Yellow</td>
<td>4</td>
<td>7</td>
<td>29</td>
</tr>
<tr>
<td>Green</td>
<td>4</td>
<td>7</td>
<td>29</td>
</tr>
</tbody>
</table>

Type W  
Likelihood = .85

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orange</td>
<td>29</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Yellow</td>
<td>29</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Green</td>
<td>29</td>
<td>7</td>
<td>4</td>
</tr>
</tbody>
</table>

Type Z  
Likelihood = .15

Choose One:
- Orange
- Yellow
- Green
- OK
Table 3.1:
Percentage of Time Both Subjects Choose Dominant Pure Strategies.

<table>
<thead>
<tr>
<th>Round 1</th>
<th>Round 2</th>
<th>Round 3</th>
<th>Round 4</th>
<th>Round 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>29.17%</td>
<td>52.08%</td>
<td>75.09%</td>
<td>83.33%</td>
<td>81.25%</td>
</tr>
</tbody>
</table>
Table 3.2:
Level of Coordination for Four-Person Pure Coordination Game.

<table>
<thead>
<tr>
<th>Number of Players in Group Choosing Same Color</th>
<th>Expected Percentage Under Null Ho</th>
<th>Observed Percentage</th>
<th>Observed Group Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>44.9</td>
<td>45.5</td>
<td>61</td>
</tr>
<tr>
<td>3</td>
<td>44.2</td>
<td>35.1</td>
<td>47</td>
</tr>
<tr>
<td>4</td>
<td>10.9</td>
<td>19.4</td>
<td>26</td>
</tr>
<tr>
<td>Totals</td>
<td>100</td>
<td>100</td>
<td>134</td>
</tr>
</tbody>
</table>
Table 3.3: Percentage of Time Colors Were Presented and Selected in the Four-Person Pure Coordination Game.

<table>
<thead>
<tr>
<th></th>
<th>% Brown</th>
<th>% Gray</th>
<th>% Green</th>
<th>% Yellow</th>
<th>% Orange</th>
<th>% White</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment</td>
<td>16.4</td>
<td>20.9</td>
<td>18.4</td>
<td>13.4</td>
<td>14.9</td>
<td>15.9</td>
</tr>
<tr>
<td>Subject</td>
<td>7.8</td>
<td>13.2</td>
<td>38.1</td>
<td>12.7</td>
<td>13.2</td>
<td>14.9</td>
</tr>
</tbody>
</table>

Chi-square: 28.69 (p < .001) (d.f. = 5)
Table 3.4:
Levels of Follower Coordination in Game Three

<table>
<thead>
<tr>
<th>Number of Players in Group Choosing Same Color</th>
<th>Expected Under Mixed Strategy</th>
<th>Observed Percentage</th>
<th>Observed Group Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>66.6</td>
<td>3.4</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>29.7</td>
<td>16.9</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>3.7</td>
<td>79.7</td>
<td>94</td>
</tr>
<tr>
<td>Totals</td>
<td>100</td>
<td>100</td>
<td>118</td>
</tr>
</tbody>
</table>
Table 3.5:
Levels of Follower Coordination in Game Four

<table>
<thead>
<tr>
<th>Number of Followers in Group Choosing Same Color</th>
<th>Expected Under Mixed Strategy</th>
<th>With Credible Leaders</th>
<th>With Non-Credible Leaders</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>66.6%</td>
<td>16.5%</td>
<td>4.0%</td>
</tr>
<tr>
<td>2</td>
<td>29.7%</td>
<td>44.0%</td>
<td>60.0%</td>
</tr>
<tr>
<td>3</td>
<td>3.7%</td>
<td>39.4%</td>
<td>36%</td>
</tr>
<tr>
<td>Totals</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>
Table 3.6:
Levels of Follower Coordination in Game Four By Leader Type Manipulation

<table>
<thead>
<tr>
<th>Probability of a Good Leader</th>
<th>Percentage of Groups with 0 Follower Coordinating (Frequencies in Parentheses)</th>
<th>Percentage of Groups with 2 Follower Coordinating (Frequencies in Parentheses)</th>
<th>Percentage of Groups with 3 Follower Coordinating (Frequencies in Parentheses)</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>.50</td>
<td>10.6 (7)</td>
<td>62.1 (41)</td>
<td>27.3 (18)</td>
<td>100 (66)</td>
</tr>
<tr>
<td>.85</td>
<td>17.6 (12)</td>
<td>32.4 (22)</td>
<td>50.0 (34)</td>
<td>100 (68)</td>
</tr>
</tbody>
</table>

Chi square: 17.71 (d.f. = 2) (p < .001)
Table 3.7:
Group Congruence with Leader Signals (Column Percentages)

<table>
<thead>
<tr>
<th>Number in</th>
<th>Expected Under Mixed Strategy</th>
<th>.50 Probability Manipulation</th>
<th>.85 Probability Manipulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Picking</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>29.63%</td>
<td>1.5%</td>
<td>0%</td>
</tr>
<tr>
<td>1</td>
<td>44.44%</td>
<td>24.2%</td>
<td>10.3%</td>
</tr>
<tr>
<td>Leader's Signal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>22.22%</td>
<td>40.9%</td>
<td>27.9%</td>
</tr>
<tr>
<td>3</td>
<td>3.7%</td>
<td>33.3%</td>
<td>61.8%</td>
</tr>
</tbody>
</table>

n=66  n=68
Table 3.8:  
Signaling Strategies by Leader Type (Column Percentages)

<table>
<thead>
<tr>
<th></th>
<th>&quot;Bad&quot; Leaders</th>
<th>&quot;Good&quot; Leaders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal Three</td>
<td>32.6%</td>
<td>1.1%</td>
</tr>
<tr>
<td>Different Colors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signal Two</td>
<td>14.0%</td>
<td>3.3%</td>
</tr>
<tr>
<td>Different Colors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signal One</td>
<td>53.5%</td>
<td>95.6%</td>
</tr>
<tr>
<td>Color</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n=43</td>
<td>n=91</td>
<td></td>
</tr>
</tbody>
</table>
Appendix 3.1

The data for this analysis are pooled from two different experimental sessions. In the first, the order of the conditions was sequential (i.e., first subjects participated in condition one, followed by condition two, condition three, etc.) and "even" (i.e., subjects made five decisions within each setting). In the second session, the order of the conditions was randomly determined (minus condition one, which was not employed), and subjects made only a single group decision before being randomly assigned to a new setting. Here, I present evidence on the appropriateness of pooling data from the two sessions.

As can be seen in the table below, the two sessions produced very similar results. None of the differences are statistically significant at traditional levels, and the differences are "substantively" similar as well.

<p>|                     | Random (Mean) | Order (Mean) | Sequential (Mean) | Order (Mean) | T | Prob&gt;|T|
|---------------------|---------------|--------------|-------------------|--------------|---|--------|
| Condition Two: # of Matches in Group (out of 4) | 2.66 .83 | 2.78 .73 | .84 .40 |
| Condition Three: # of Matches in Group (out of 3) | 2.79 .50 | 2.76 .51 | -.27 .78 |
| Condition Three: % of Matching Signals in Group | .96 .19 | .96 .21 | -.20 .84 |</p>
<table>
<thead>
<tr>
<th>Condition Three:</th>
</tr>
</thead>
<tbody>
<tr>
<td># in Group</td>
</tr>
<tr>
<td>Matching</td>
</tr>
<tr>
<td>Leader's Signal</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>2.68</td>
</tr>
<tr>
<td>.77</td>
</tr>
<tr>
<td>2.8</td>
</tr>
<tr>
<td>.45</td>
</tr>
<tr>
<td>1.03</td>
</tr>
<tr>
<td>.31</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Condition Four:</th>
</tr>
</thead>
<tbody>
<tr>
<td># of Matches</td>
</tr>
<tr>
<td>in Group</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>2.16</td>
</tr>
<tr>
<td>.71</td>
</tr>
<tr>
<td>2.29</td>
</tr>
<tr>
<td>.67</td>
</tr>
<tr>
<td>1.03</td>
</tr>
<tr>
<td>.31</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Condition Four:</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of</td>
</tr>
<tr>
<td>Matching</td>
</tr>
<tr>
<td>Signals in</td>
</tr>
<tr>
<td>Group</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>.84</td>
</tr>
<tr>
<td>.37</td>
</tr>
<tr>
<td>.81</td>
</tr>
<tr>
<td>.39</td>
</tr>
<tr>
<td>-.42</td>
</tr>
<tr>
<td>.68</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Condition Four:</th>
</tr>
</thead>
<tbody>
<tr>
<td># in Group</td>
</tr>
<tr>
<td>Matching</td>
</tr>
<tr>
<td>Leader's Signal</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>2.16</td>
</tr>
<tr>
<td>.83</td>
</tr>
<tr>
<td>2.36</td>
</tr>
<tr>
<td>.80</td>
</tr>
<tr>
<td>1.39</td>
</tr>
<tr>
<td>.17</td>
</tr>
</tbody>
</table>
Chapter Four

Leaders and Followers in a Repeated Coordination Game

In Chapter Three, cheap-talk signals were powerful tools for highly constrained leaders. In both theory and result, leaders assist their charges in overcoming problems of coordination by merely suggesting a course of action. This power to lead, however, is highly contingent on the leader’s reputation, the degree to which followers believe that their leader can trusted. In this chapter, I further examine the importance of reputation by iterating the underlying coordination problem. In Chapter Three, reputation was artificially fixed (provided) for the followers, and remained static as an a priori belief. In this chapter, I breath life into the reputational dynamic by allowing actors to actively update and alter their beliefs as play unfolds before them.

As discussed in Chapter One, many theorists have shown that repetition, especially “infinite” (i.e., indefinite) repetition, endows actors with the opportunity to solve otherwise insurmountable social dilemmas. This need not be true in practice, however, as there are an infinite number of equilibrium paths.

The question of whether the introduction of repetition will help or hinder actors engaged in a coordination problem, the dynamic of leadership, and the role of reputation is more than an esoteric theoretical problem. Coordination problems occur in many real-life institutional settings, and they rarely occur in isolation. Rather, they are presented and addressed (successfully or unsuccessfully) again and again, at times with new actors, and often with new choices. This chapter assesses whether one prominent institutional
feature, leadership, enables individuals to weave their way through the type of
coordination problem most likely to be present in the real-world.

Will repetition allow leaders to be more effective than they were in Chapter
Three? Or will the introduction of repetition and its attendant complexity further limit
the leader’s ability to affect follower behavior? Before presenting an answer to these
questions, it is necessary to begin with a solid theoretical foundation.

_Leaders and Followers in an Infinitely Repeated Coordination Game_

Although much of the logic underlying the single-stage and repeated coordination
games is similar, components of the model under repetition are quite distinct. The form
of presentation and proof in this chapter will be to first establish and discuss a
proposition in round $t$, and then show that it holds for round $(t+1)$ as well. Discussion of
a proposition that is similar to the single-stage proofs of Chapter Three will be brief, but
will be considerably longer where the two settings differ.

Consider two games, $\Gamma_1 = (C)$ and $\Gamma_2 = (C, T)$. Let $\Gamma_1$ be defined exactly as
$\Gamma_1$ in Chapter Three. $\Gamma_1$, then, represents an n-person matching game, in which n players
simultaneously choose between k objects (importantly, let $n > k$). The more players who
coordinate on a particular choice, the higher the payoffs. There are k Nash equilibria for
this game, one for each object in the choice set.
In $\Gamma_2 = (C, T)$, let $C$ be defined as above, and let $T = \{1, 2, \ldots, \infty\}$ denote the number of repetitions in the game. Let this value be common knowledge. In each iteration of $\Gamma_2$, players choose privately and simultaneously from the choice set as before. At the conclusion of each stage, the choices, outcomes, and payoffs are revealed to all actors, who are then advanced to the next stage of the game with full knowledge of the game's history.

In this game, I assume that actors discount future payoffs relative to current payoffs. Let the rate of discounting be given by $\delta$, where $0 \leq \delta < 1$. Let the payoffs for this game be given as,

$$u_i = \sum_{t=0}^{\infty} \delta^t f \left( \sum_{j=1}^{n} c_{ji} \right),$$

(4.1)

where $f$ represents some monotonic increasing function, and where $\sum c_{ji}$ is a simple counter in which with $c_{ji} = \begin{cases} 1 & \text{if } c_i = c_j \\ 0 & \text{otherwise} \end{cases}$. Proposition 4.1 describes the equilibrium for this game.

**Proposition 4.1**: In $\Gamma_2, \forall t, \delta$, there are $k^\infty$ Nash equilibria in pure strategies given as $C$

$$= \{c_{i1'}, c_{i2'}, \ldots, c_{n'}\}, \text{ where } c_{i'} = c_j' \forall i, j, t. \quad \text{1}$$

---

1 Note that players are free either to coordinate around the same element over time, or to pick a new element from the choice set at each iteration. Such distinctions, in terms of the game's equilibrium properties, are irrelevant. An equilibrium path is constructed whenever players pick the same element in
In round \( t \), suppose that the strategy vector \( \{c^*_i, \ldots, c^*_n, \ldots, c^*_n\} \) is selected and all but the \( i \)th actor has chosen the same element (for example, \( i \) selected \( k \), while all others selected \( b \)). Once the outcome is announced, if given a chance, \( i \) would unilaterally change her strategy to \( c^*_i \). By playing \( c_i \), \( \sum_{j=1}^{n} c_{ji} = 1 \), whereas by switching to \( c^*_i \), \( \sum_{j=1}^{n} c^*_{ji} = n \). If the strategy vector \( \{c^*_1, \ldots, c^*_i, \ldots, c^*_n\} \) is played, no actor, ex post, would unilaterally choose \( c_i \). To do so would be to earn the outcome \( f(1) \) in round \( t \).

In round \((t+1)\), suppose that a different strategy vector \( \{c^*_{i(t+1)}, c^*_{j(t+1)}, \ldots, c^*_{n(t+1)}\} \) is played, and all but the \( j \)th actor choose the same element. Like round \( t \), if given a chance, \( j \) would unilaterally switch her strategy, ex post, to \( c^*_{j(t+1)} \) to earn the maximum payoff, \( f(n) \).

Indeed, if such an equilibrium is adhered to for an infinite number of iterations \( \{t, (t+1), (t+2), \ldots, \infty\} \), each player earns the maximum payoff, \( \frac{f(n)}{1-\delta} \), from which no actor has a unilateral incentive to deviate at any iteration in the game.

---

*each iteration, regardless of whether it is the same element over time, or a new (or rotating set of) element(s) for each passing round.*
Proposition 4.1 describes an equilibrium path through $\Gamma_2$. What it does not show is that absent communication, and with a choice set that varies with the passage of time, it is highly unlikely that actors could identify and sustain themselves on a pareto optimal equilibrium path. All that is required to earn the maximum payoff is for each player to pick the same element at each iteration. But in fact, as both the number of choices and players increase, it becomes increasingly unlikely that players will be able to solve this social dilemma without an institutionally imposed focal point.

How could a highly constrained leader assist a set of individuals in this game? As in Chapter Three, leaders who are endowed with a perfect reputation in the eyes of their charges can have a dramatic impact on the rate of follower success. Leaders can lead by suggesting a course of action to each follower at the outset of each iteration of the game. Followers, recognizing that their chances for success without the leader are slim, and confident in the leader’s motivation, voluntarily choose to follow the leader’s advice.

To examine this dynamic more formally, consider an additional game, $\Gamma_3 = (C, T, S)$, which grants a limited set of powers to one of the actors, a leader. Let $C$ and $T$ be defined as above, and let $S = \{s_1, s_2, \ldots, s_n\}$ represent the vector of signals sent by the leader. In this game, at the beginning of each iteration, the leader is able to costlessly and privately suggest an element from the choice set to each of the other actors. Upon receipt of the leader’s suggestion, all actors engage in a matching game as before.

In this game, the motivations facing leaders and followers are the same: the greater the number who coordinate on a particular option in a given round, the higher the payoffs.
If there is a one-to-one mapping from signal to choice \( S \rightarrow C \), then the leader faces strong incentives to enable to the followers to coordinate around the sequence of options that she selects. In each round, there are \( k \) different vectors of signals that the leader could send in equilibrium, each mapped onto the \( k \) equilibrium in choices. The leader will send the same signal to all actors in each round, and the best response for the followers is always to heed the leader’s advice.

**Proposition 4.2:** In \( \Gamma_j, \forall t, \delta \), there are \( k^m \) equilibrium signaling strategies given as

\[
S = \{s_{i_1}, \ldots, s_{i_t}, \ldots, s_{i_n}\} \quad \text{where} \quad s_{i_t} = s_{j_t} \quad \forall i, j, \text{ and } t.
\]

Suppose in round \( t \) that the leader picks a signaling strategy \( \{s_{i_1}^*, \ldots, s_{i_t}^*, \ldots, s_{i_k}^*, \ldots, s_{i_n}^*\} \) in which all \( s_{i_t}^* = s_{j_t}^* \), except for the \( k \)th individual, who receives a different signal. Suppose that all followers obey the leader and pick the element suggested. If the leader picks \( s_i^* \) then her payoff is \( f(n - 1) \) for round \( t \). *Ex post* the leader would switch her strategy to \( \{s_{i_1}^*, \ldots, s_{i_t}^*, \ldots, s_{i_k}^*, \ldots, s_{i_n}^*\} \) because, if all followers obeyed the signals, the leader would earn \( f(n) \) instead of only \( f(n - 1) \).

In round \( (t+1) \), the leader would again prefer \( \{s_{i_1}^*, \ldots, s_{i_t}^*, \ldots, s_{i_k}^*, \ldots, s_{i_n}^*\} \) over any other signaling vector in which \( s_i^* \neq s_j^* \), assuming all followers obey. If the leader
chooses the former over the entire duration of the game, then the leader can look forward to her maximum payoff, $\frac{f(n)}{(1 - \delta)}$.

**Proposition 4.3:** In $\Gamma$, $\forall t, \delta$, a leader's signal is credible if $s^*_t \Rightarrow c^*_t$.

Given complete information about the leader's payoff function, i's beliefs are that in any given round $t$, a leader will choose what the leader signaled. i then assumes that the leader will send the same signal to all followers in round $t$, and that he can do no better than to follow the leader's suggestion.

In round $(t+1)$ the same strategic considerations are in place. Indeed, no follower has an incentive to deviate from the equilibrium path in which leaders suggest the same element to all followers within a given round, and all followers obey. Such a path yields $\frac{f(n)}{(1 - \delta)}$ for all actors, the maximum payoff.

A repeated coordination game with a set of followers and a known, “good” leader works exactly as it did in the single-stage games. Leaders, motivated to assist followers, face strong incentives to send a coordinating signal. Followers, confident in the leader’s motivation, accept the leader’s suggestion. The result is that a leader, one who enjoys a perfect reputation in the eyes of her charges, enables followers to sustain a pareto-optimal path throughout the game.
In many settings, however, at least some followers have reason to doubt the motivations of their leader. To formalize this uncertainty, consider $\Gamma_4 = (C, S, T, p)$, where $C, S, T$ are defined as before, and $p$ represents the probability of a good leader (with probability $(1 - p)$, the leader is bad). When the game begins, followers know that they have a leader, but do not know with certainty her type. As in Chapter Three, good and bad leaders are defined by the congruence of their interests with those of the followers, and their type only is revealed after the first decision has been made. From the second period on, followers know the leader's type with certainty.

If the leader is good, and the followers know this, then the game works exactly as $\Gamma_3$. But if the leader is bad, the game is quite different. Not only is it distinct from $\Gamma_3$, but it is also distinct from the models of Chapter Three. As we shall see, the nature of
the game is critically dependent on the relationship between the number of actors, the number of choices, and \( \delta \), the extent to which actors discount the future\(^2\).

As in Chapter Three, under bad leaders, the payoffs for the game change, and are given as

\[
u_i = \sum_{t=0}^{\infty} \delta^t f\left((n+1) - \sum_{j=1}^{n} C_{ji}\right)\]

(4.2)

Under bad leaders, the leader and followers alike face strong incentives to avoid picking the same element. Yet unlike the single-stage game, a bad leader's signal can be credible. Moreover, bad leaders will attempt to use this credibility to systematically favor some followers (and thereby themselves) at the expense of others. To explore the dynamic, I begin with a discussion of the incentives and strategies available to bad leaders.

The challenge facing a bad leader is seemingly straightforward: over the entire duration of the game, minimize the number of common choices with the followers. In the single-stage game, the strategy that bad leaders adopted in pursuit of this goal was simple, and in an important sense, in direct conflict with the well-being of all of the followers: Convince all the followers to choose one element, and then pick something entirely different.

In repetition however, the bad leader will exchange this direct, conflictual approach for one that is more subtle and divisive: Carefully steer a subset of the followers

\(^2\) Provided that \( n > k \). If \( k \geq n \), the game is trivial for both good and bad leaders. As noted on the first
toward some choices and away from others, while leaving the remaining followers to their own devices. By forming an implicit pact with a subset of the followers, bad leaders can increase their own payoffs over time. Moreover, rather than standing in opposition to all followers, as they were in the single-stage game, bad leaders intentionally split the followers into two groups: one that is favored, and one that is not.

As a point of reference, assume that the leader's signal is initially credible, and consider what would happen if a bad leader adopted the single-stage game strategy in which she told all the followers to pick the same element in the first round (i.e., the leaders selected $S = \{s_{1t}, \ldots, s_{tt}, \ldots, s_{nt}\}$ where $s_{it} = s_{jt}$ $\forall i, j$ and $t = 1$. Henceforth, this signaling strategy will be called strategy one). Such a strategy would indeed net the leader the maximum payoff in the first round, but a small payoff in all subsequent rounds. After the first round, followers would know that they were playing with a bad leader (a fact that is perfectly revealed), and, on the basis of their experience (i.e., the second-worst payoff possible) would never again offer the leader their trust.

If a bad leader adapted strategy one, she could expect

$$f(n) + \frac{\delta f \left( n + 1 \right) - \frac{n}{k}}{1 - \delta}$$

over the duration of the game. Given credibility in the first round, all followers would obey, giving the leader her maximum payoff. After the first round, the followers would

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page of this chapter, in this analysis, $n > k$.  


adopt a mixed strategy in hopes of minimizing the number of matches on a particular choice. The leader, given an ineffectual signal, would mix as well. Therefore, under strategy one, (and given an initially credible leader), followers could expect

\[ f((n + 1) - (n - 1)) + \frac{\delta f\left((n + 1) - \frac{n}{k}\right)}{1 - \delta}. \] (4.4)

The payoff that leaders receive under strategy one serves to highlight an important tradeoff for bad leaders: Strategies that maximize short-term gains often minimize long-term rewards. Strategy one produces a large initial payoff, but then forces the leader to accept an infinite string of middling payoffs, the expected number of matches under universally adopted mixed strategies. As we shall see, this tradeoff between the long and short term is inherent in this game, and is the driving force behind a bad leader’s strategic thinking.

Now suppose that the leader adopts an alternative approach, labeled strategy two. The leader begins the game by singling out a small subset of the followers, totaling \((k - 1)\) in number. The leader sends a unique signal to each member of this favored group. To the remaining \((n - k)\) followers, she sends a common element, which she chooses herself in the first round.

In all subsequent rounds, the leader again sends a unique element to the \((k - 1)\) favored followers, but then chooses the \(k\)th (and last) unique element for herself. In subsequent rounds, favored followers will continue to find it profitable to obey, which
means that the leader can ensure that she never matches these followers. The only followers then she can match are the disfavored group, who, as will be shown below, randomly make their choices from then on. Under strategy two, a leader expects

\[
f((n + 1) - (n - (k - 1))) + \frac{\delta f \left( (n + 1) - \sum_{m=0}^{n-k} \left( \binom{n-k}{m} \left( \frac{1}{k} \right)^m \left( 1 - \frac{1}{k} \right)^{(n-k)-m} \right) \right)}{1 - \delta}
\]

(4.5)

where \( m \) = the number of matches.

The first term gives the leader’s payoff in round one when she intentionally matches \((n - k)\) followers. The second term gives the discounted sum of all future payoffs in which the favored followers obey, and the \((n - k)\) disfavored followers randomly make their selection. By comparing the long-term (i.e., sum of payoffs from the second period on) payoff under strategy two and the long-term payoff under strategy one, we can see that over the long haul, strategy two is better, while in the short-term strategy one clearly is superior.

The reason that the long-term payoff under strategy two is better is that the leader ensures that she never matches the \((k - 1)\) favored followers over the long-term. Favored followers always receive a unique signal, and the leader chooses the final unique choice, the \( k \)th, for herself. The only followers she can match then are the \((n - k)\) disfavored
followers, and this will only happen probabilistically\(^3\). Under strategy one, however, the leader can match any and all of the followers after the first round. Strategy two requires the leader to intentionally match the disfavored group in order to win the long-term loyalty and obedience of the favored followers.

Moreover, favored followers under strategy two will continue to offer their loyalty as the game progresses. Favored followers, although fully informed of the leader’s type after the first round, know that they received the maximum payoff in round one. Further, they know that strategy two is a credible commitment for the leader to make, in that it is congruent with the leader’s interest (under certain conditions, see below). Under strategy two, favored followers expect

\[
\delta f \left( \frac{(n + 1) - \sum_{m=0}^{n-k} \left( \frac{n - k}{m} \left( \frac{1}{k} \right)^m \left( 1 - \frac{1}{k} \right)^{(n-k) - m} \right)}{1 - \delta} \right),
\]

where the first term is the payoff from round one and the second term is the discounted sum of all future payoffs from obeying the leader in all subsequent rounds.

If they were to abandon the leader and adopt a mixed strategy with the disfavored followers, they would expect

\[
\delta f \left( \frac{(n + 1) - \frac{n}{k}}{1 - \delta} \right),
\]

\(^3\) Distributed as the binomial with the \(N = (n - k)\), the number of disfavored followers, and the probability of a success, or match, \(= 1/k\). The expected number of matches for the leader is then \((n - k)/k\).
where the first term is again the payoff from round one, and the second term is the discounted sum of all players mixing.

As a favored follower, playing along with the leader even through they know the leader’s type is worthwhile here whenever \( k \geq 0 \), which is always the case. Favored followers, therefore, will always accept their privileges under a bad leader under strategy two.

The lot of disfavored followers, however, is not so pleasant. The expectation for a disfavored follower under strategy two is given as

\[
\delta f \left( (n + 1) - \frac{\sum_{m=0}^{n-k} \binom{n-k}{m} \left( \frac{1}{k} \right)^m \left( 1 - \frac{1}{k} \right)^{n-k-m}}{1 - \delta} \right)
\]

(4.8)

After obeying an initially credible leader in round one, disfavored followers (like all players in the game) are informed of their own choices, their own payoffs, what others choose, their payoffs, and the leader’s type. They therefore know that they received a low payoff relative to the favored followers, who all chose a unique element. They also can observe that the leader did just as poorly. These are telltale signs of strategy two, in which the leader maximizes the number of favored followers \((k - 1)\) by intentionally matching \((n - k)\) other followers. In the future they know that the leader will continue to
send the favored followers unique elements and save the last unique element for herself.

They know, therefore, that the “fix is in.” The question becomes, what can they do about it?

First, they cannot pick a unique element because the favored followers and the leader have each taken one (and in total, all) of the available choices. No matter what they pick, therefore, they will match someone (which is why an additional match has been added to the second term).

Second, they cannot glean any information from the leader’s signal. Is, they must ask, the leader telling me to do something that’s not in my interest, hoping I will, or is the leader sending me misinformation: asking me to do something that is actually in my interest, hoping I won’t? Even if they could, as individuals, glean information from the leader’s signal, they cannot create a coordinated response among the group (of disfavored followers) because they cannot communicate amongst themselves.

Third, they cannot attempt to “break up” the favored coalition by always coordinating on the color choice of a particular member. Such a strategy would require communication among the disfavored followers, which is unavailable. It also would require a costly commitment from each disfavored follower, as they would need to intentionally match on a particular choice in order to inflict pain on a subset of the favored coalition. Moreover, a leader could easily counter such a strategy by merely rotating the signals (and thereby the choices) amongst the favored coalition.

There is, therefore, little the disfavored faction can do. What they can do, however, is to try to minimize the number of matches within themselves. This is best
accomplished by randomly selecting from the choice set from the second period out. Their expected payoff after the first round, therefore, is the discounted sum of randomly matching their fellow disfavored followers (distributed as the binomial with $\mu = (n - k)/k$), plus an assured match with one of the favored followers or the leader.

Strategy one and two, then, represent two poles in the leader’s strategy set. Strategy one maximizes gains in the first round for a much lower payoffs thereafter, while strategy two takes a low payoff in round one for higher payoffs in the future. There exists a third strategy, however, that is always as good as strategy one in the short term and better in the long term. It also beats strategy two in the short term, although it is lower over the long haul.

Under strategy two, the leader began the game by sending as many unique elements as possible ($k - 1$), intentionally matching the disfavored followers in round one. Under strategy three, however, the leader sends as many unique elements as possible ($k - 2$), while retaining one unique choice for herself. The ($k - 1$)th element goes to each member of the disfavored faction (totaling ($n - (k - 1)$) in number), and the leader chooses the $k$th element alone.  

Given initial credibility, the leader expects the following under strategy three:

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$^4$ The reader will note that there are other strategies available to bad leaders as well. A bad leader could send ($k$-3) unique elements in the first round, or ($k$-4), etc.. The strategies highlighted here, however, are unique in that they minimize the number of followers who mix in later rounds, relative to the size of the leader's first round payoff.
\[
\delta f(n) + \frac{(n + 1) - \sum_{m=0}^{n-(k-1)} \binom{n-(k-1)}{m} \left( \frac{1}{k} \right)^m \left( 1 - \frac{1}{k} \right)^{(n - (k - 1)) - m}}{1 - \delta}, \tag{4.9}
\]

where the first term is the payoff under round one, and the second term is the discounted sum of all future payoffs. Under strategy three, the leader receives the maximum payoff in the first round by picking a unique element. In subsequent rounds, the leader ensures that she never matches the \((k - 2)\) favored followers because she always sends them a unique signal. She can only match the \((n - (k - 1))\) disfavored followers, which will occur probabilistically as the disfavored faction randomly makes their choices (distributed as the binomial with \(\mu = (n - (k - 1))/k\)).

Note that over the long haul, strategy two is better for the bad leader than strategy three is, due to the presence of fewer disfavored followers who will probabilistically land on the leader's choice. Under strategy two, that number is \((n - k)\), whereas under strategy three, the number is larger, \((n - (k - 1))\). This disadvantage of strategy three, however, is offset by its advantage in the short term, which obviously is higher than that of strategy two. As we will see below, which strategy the leader adopts is highly contingent on the relationship between \(n, k,\) and \(\delta\).

Like strategy two, favored followers are much better off acquiescing to the leader's scheme than going alone. If they play along with the leader, therefore ensuring that they too never match the leader or the other favored followers, they can expect
\[ f(n) + \frac{\delta f \left( (n + 1) \right.}{1 - \delta} - \sum_{m=0}^{n-(k-1)} \left[ \frac{n - (k - 1)}{m} \right] \left( \frac{1}{k} \right)^m \left( 1 - \frac{1}{k} \right)^{(n - (k - 1)) - m} \]  
(4.10)

(the same payoff that the leader receives under strategy three).

If they go it alone and adopt a mixed strategy, forcing the leader to do likewise, they can expect

\[ f(n) + \frac{\delta f \left( (n + 1) \cdot \frac{n}{k} \right)}{1 - \delta}. \]  
(4.11)

The former will be larger than the latter whenever \( k \geq 1 \). As this is always the case, favored followers always find it in their interest to play along.

Disfavored followers are as limited in their ability to retaliate as before, for all the same reasons. And although they are better off under strategy three in that it is possible for them to land on a unique element (because the leader only sent out \((k - 2)\) unique elements and took the \(k\)th for herself, leaving one available), they have no way to determine which element is unique and still available (given that the leader makes this determination, and has strong incentives to keep the disfavored followers guessing). Disfavored followers can therefore expect
under strategy three.

Which strategy will a leader choose to adopt? With certainty, a bad leader will never choose strategy one. The single-stage bad-leader strategy is never an appropriate strategy for a bad leader under repetition. Given initial credibility, strategy three is better than strategy one whenever the following condition holds:

Strategy Three $\geq$ Strategy One

$$f(n) + \frac{\delta f((n+1) - \frac{n - (k-1)}{k})}{1 - \delta} \geq$$

$$f(n) + \frac{\delta f((n+1) - \frac{n}{k})}{1 - \delta}.$$

This condition holds whenever $k \geq 1$, which is always true. Strategies one and three both produce the maximum payoff for the leader in round one. Strategy three is always better over the long-haul, however, because the leader guarantees that she never
matches \((k - 2)\) followers, while under strategy one the leader can probabilistically match all the followers. Therefore, the leader always will adopt strategy three over strategy one.

The tradeoffs between strategy two and three, however, are more subtle. Strategy three is better in round one, producing the maximum payoff. Strategy two is better over the long term, because the leader can match less followers under strategy two \((n - k)\) than under strategy three \((n - (k - 1))\). The key parameter will be the leader’s discount rate. Highly patient leaders will adapt strategy two, as the reduced payoff they take in round one is compensated over the long term. Less patient leaders will adapt strategy three, taking the short-term gain over the accrued payoffs over time.

Specifically, strategy three will be adopted over strategy two whenever the following condition holds:

\[
\text{Strategy Three} \geq \text{Strategy Two}
\]

\[
f(n) + \frac{\delta f \left( \frac{n + 1}{(n + 1) - \sum_{m=0}^{n-k-1} \left( \begin{array}{c}
(n \kern-1.5pt - \kern-1.5pt (k - 1)) \\
m
\end{array} \right) \left( \frac{1}{k} \right)^{m} \left( 1 - \frac{1}{k} \right)^{(n - (k - 1)) - m} \right)}{1 - \delta} \geq
\]

\[
f((n + 1) - (n - (k - 1))) + \frac{\delta f \left( \frac{n + 1}{(n + 1) - \sum_{m=0}^{n-k} \left( \begin{array}{c}
(n \kern-1.5pt - \kern-1.5pt k) \\
m
\end{array} \right) \left( \frac{1}{k} \right)^{m} \left( 1 - \frac{1}{k} \right)^{(n - k) - m} \right)}{1 - \delta},
\]

which is true whenever
\[ \delta \leq \frac{k - n}{k - n - \frac{1}{k}}. \] (4.13)

If \( \delta \) is less than this quotient, a leader will adopt strategy three. If not, a leader will adopt strategy two.

No matter what strategy leaders adopt, followers must decide in round one whether to offer or withhold their trust. To this point, we have assumed that a leader’s signal is initially credible, but as we shall see, this need not be the case.

In the single-stage games, the only parameter of interest to followers in determining the leader’s credibility was the probability of having a good leader, \( p \). But in repetition, not only are followers concerned with whether or not they have a good or a bad leader, but also with whether they will be part of the favored or disfavored faction, should the leader be bad. As shown above, payoffs for followers under a bad leader will vary dramatically depending upon whether or not they are favored by the leader or not.

In repetition, the type of leader is perfectly revealed after the first period. After round one, followers know what type of leader they have, whether or not they were favored (assuming initial credibility), and whether or not it is in their interest to play along with the leader’s scheme if favored (which it always is). At the outset of the game, therefore, the only time frame of relevance for the follower is the first round.
Assume that \( \delta \leq \frac{k - n}{k - n - \frac{1}{k}} \), and that therefore bad leaders will adopt strategy three (and followers know this, because all required information is common knowledge).

If followers obey the leader in the first round, they have the following the expectation:

\[
p f(n) + (1 - p) \left( \left( \frac{k - 2}{n - 1} \right) f(n) + \left( 1 - \frac{k - 2}{n - 1} \right) f((n + 1) - (n - (k - 1))) \right). \tag{4.14}
\]

With probability \( p \), the leader is good, and if the followers obey, they expect the maximum payoff. With probability \( (1 - p) \), the leader is bad, and followers must form expectations over their inclusion in or exclusion from the favored faction. Given no \( a \) priori reason to choose one follower over another, followers assume that their probability of being favored is simply the ratio of available favored slots (under strategy three, \((k - 2)\)) to the number of followers \(((n - 1)\), minus the leader). With this probability, a follower expects to be favored if the leader is bad, and therefore receive the maximum payoff. With one minus this probability, a follower expects to be in the disfavored faction, earning a low payoff.

Similarly, if followers mix in the first round, they expect

\[
p f\left( \frac{n}{k} \right) + (1 - p) \left( \left( \frac{k - 2}{n - 1} \right) f\left( n + 1 \right) - \left( \frac{n}{k} \right) \right) + \left( 1 - \frac{k - 2}{n - 1} \right) f\left( (n + 1) - \left( \frac{n}{k} \right) \right),
\]
with all probabilities calculated in a similar fashion, and the concomitant payoffs reflecting the expected number of matches if all players mix their strategies.

Followers will obey an uncertain leader in the first round when \( p \) meets a critical threshold,

\[
p > \frac{-2k^2 + k^3 + n + kn - k^2n - n^2 + kn^2}{-2k^2 + k^3 + 2n - k^2n - 2n^2 + 2kn^2}.
\]

(4.16)

If a leader adopts strategy two, the logic of credibility remains the same, although the calculations are slightly different. Under strategy two, each follower has a higher probability of being favored by a bad leader (i.e., there are \( k - 1 \) favored slots rather than \( k - 2 \)).

If followers obey, they expect

\[
p f(n) + (1 - p) \left( \left( \frac{k - 1}{n - 1} \right) f(n) + \left( 1 - \frac{k - 1}{n - 1} \right) f((n + 1) - (n - (k - 1))) \right),
\]

(4.17)

whereas if they ignore the leader's counsel, they expect
\[ p f\left( \frac{n}{k} \right) + (1 - p) \left( \left( \frac{k - 1}{n - 1} \right) f\left( n^2 + 1 \right) - \left( \frac{n}{k} \right) \right) + \left( 1 - \frac{k - 1}{n - 1} \right) f\left( n^2 + 1 \right) - \left( \frac{n}{k} \right) \right]. \]

(4.18)

Followers will offer the leader their trust whenever

\[ p > \frac{k^2 - n - kn + n^2}{k^2 - 2n - kn + 2n^2}. \]

(4.19)

Having worked through the logic of leaders and followers in repeated coordination game, I now present a summary proposition.

Proposition 4.4: In \( \Gamma_4 \),

\[ \forall t, \delta, \text{ good leaders will adopt a signaling strategy given as } S = \{s_i, \ldots, s_i, \ldots, s_m\} \]

where \( s_i = s_j \forall i, j, \text{ and } t. \)

If \( \delta \leq \frac{k - n}{k - n - \frac{k}{k}}, \) in \( t = 1 \), bad leaders will send \( (k - 2) \) followers a unique signal, and \( (n - (k - 1)) \) followers a common signal, choosing the \( k \)th object for
herself. For all $t \geq 2$, bad leaders will continue to send the favored followers a unique signal, and select a unique choice for herself.

If $\delta \geq \frac{k - n}{k - n - \frac{l}{k}}$, in $t = 1$, bad leaders will send $(k - 1)$ followers a unique signal, and $(n - k)$ followers a common signal, choosing the same element as the disfavored faction. For all $t \geq 2$, bad leaders will continue to send the favored faction a unique signal and choose a unique choice for herself.

If $t = 1$, and if $\delta \leq \frac{k - n}{k - n - \frac{l}{k}}$, followers will obey the leader if

$$p > \frac{-2k^2 + k^3 + n + kn - k^2n - n^2 + kn^2}{-2k^2 + k^3 + 2n - k^2n - 2n^2 + 2kn^2}.$$ 

In $t \geq 2$, favored followers will continue to obey the leader, and disfavored followers will randomly make a selection.

If $t = 1$, and if $\delta \geq \frac{k - n}{k - n - \frac{l}{k}}$, followers will obey the leader if

$$p > \frac{k^2 - n - kn + n^2}{k^2 - 2n - kn + 2n^2}.$$ 

In $t \geq 2$, favored followers will continue to obey the leader, and disfavored followers will randomly make a selection.
Leaders and Followers in a Finitely Repeated Coordination Game

In finite repetition, much of the logic that underlies the infinitely repeated game is the same, except that what matters here is not the discount rate, but the length of the game itself. Although many finitely repeated games are driven by trembling-hand equilibria in which players must decide at one point in the game a particular strategy will “unravel,” such dynamics are not the case here. This is because good leaders, bad leaders, and favored followers each have an incentive to sustain an equilibrium path once it is reached. Each additional round brings gains that are greater than or equal to that which could be achieved from mixed strategies. Therefore, good leaders, bad leaders, and favored followers never have an incentive to “defect” from the stage-by-stage equilibrium, even in the final round. The dynamic in the finitely repeated coordination game, then, is largely the same as the infinitely repeated game. Good leaders endeavor to assist the entire group, while bad leaders splinter the followers into favored and penalized sets. How exactly this dynamic unfolds is driven largely by the length of the finitely repeated game. Since much of the logic of the finitely repeated game is the same as that in the infinitely repeated game, I will assume that the reader is familiar and conformable with this logic, and will only briefly sketch out the game’s contours.

Consider a game \( \Gamma_t = (C, T) \), let \( C \) be defined as above, and let \( T = \{1, 2, ..., t\} \) denote the number of stages in the finitely repeated game. Let the value of \( T \) be common knowledge. The payoffs for this game are simply the sum of the stage-game payoffs for \( t \) rounds, and are given as
u_i = \sum_{t=0}^{T} f \left( \sum_{j=1}^{n} c_{ji} \right).

The equilibrium properties of \( \Gamma_s \) are similar to the equilibrium properties of its infinitely repeated counterpart. In each stage, each player has strong incentives to coordinate on the same choice. Absent communication, and with a rotating choice set, this is very difficult to do in practice.

\( \Gamma_s = (C, T, S) \) introduces a “good” leader who is motivated to assist the followers. Let \( C, T, \) and \( S \) be defined as above. In equilibrium, good leaders will send the same signal to each follower, and all followers will obey that credible signal.

\( \Gamma_r = (C, T, S, p) \), with all terms defined as above, introduces uncertainty about the leader’s motivation. Under good leaders, payoffs remain the same. Under bad leaders, payoffs change to

\[
\sum_{t=1}^{T} f \left( (n + 1) - \sum_{j=1}^{N} c_{ji} \right).
\]

Good leaders will continue to send the same signal to all followers. Bad leaders will again decide between strategy two and strategy three. The expected payoff for bad leaders under strategy two is given by
\[ f((n + 1) - (n - (k - 1))) + (T - 1) f\left((n + 1) - \frac{n - k}{k}\right). \]

The expected payoff from playing strategy three is given by

\[ f(n) + (T - 1) f\left((n + 1) - \frac{n - (k - 1)}{k}\right). \]

Setting the two payoffs equal to each other and solving for \( T \), the length of the game, bad leaders will adopt strategy two whenever \( T \geq kn + 1 - k^2 \), and adopt strategy three whenever this condition does not hold.

I now to turn to an empirical assessment of these predictions.

**Experimental Design**

Data for these experiments were collected at two times, first at Rice University during the spring of 1997, and then at Texas A&M University in the summer of 1997. Because the experimental procedures employed in the two settings are slightly different, I discuss each University's procedures in turn.

**Experimental Procedure Employed at Rice University**

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5 Information on the number of observations per condition, the number of observations collected at Rice and Texas A&M, etc., can be found in Appendix 4.1.
The experimental design employed at Rice is a $2\times2\times3\times2\times3$ incomplete factorial design. It is very similar to the design of Chapter Three, but with a number of important exceptions. Collectively, these changes serve to shift the underlying social dilemma from a single-shot to a repeated game.

First, subjects were not randomly assigned new letter identities, to a new group, or to a new condition at the beginning of every decision period. Instead, they maintained the same identity as they made a number of decisions within an identical condition and group. Reflecting the theoretical models, this feature of the design aimed to encourage the development of reputational effects -- both by leaders and by followers.

Each group participated in a number of distinct repeated coordination games under one of several conditions. The order in which the games were played, although not strictly randomized, was varied in order to partially control for ordering effects. Within each game, subjects made a number of decisions in a number of different "rounds" (i.e., iterations of the game). The conditions under which subjects played the games were determined by the factorial design.

Factor one varied whether the game was finitely or infinitely (i.e., indefinitely) repeated. In the finite games, subjects played for either five or 11 rounds (factor two). Subjects were fully informed (and reminded) of the endpoint of the game prior to each round. If subjects played an indefinitely repeated game, they were told that they would play an unknown number of rounds. They were informed of the probability that any round would be the last and were shown the randomizing device used to end the game.
Three different treatments were administered, each varying the probability that the game would end after a given round. These probabilities are designed to reflect the notion of discounting detailed above. Subjects were assigned to either a .95, a .80 or a .50 probability condition (factor three).

If subjects played in an indefinitely repeated game, they were informed of the probability that any one round would end the game. If the .95 probability condition was assigned, they were shown a deck of 20 cards that contained a single ace. They were told that following each round, after decisions had been made and regardless of their group assignment, one subject would choose a card from the shuffled deck. If the ace was selected, then the game was over. If any other card was selected, then the card was replaced, the deck reshuffled, and subjects moved to the next round. For the other probability conditions, a deck of 20 cards also was used and the appropriate number of aces was put into the deck to match the designated probabilities.

Factor four varied whether the game was played with a leader or without. Without a leader, subjects chose colors without communication in an attempt to coordinate their choices. With a leader, one subject was randomly selected as the leader prior to the first round of the game. Like Chapter Three, the leader began each round by privately suggesting a color to each of the followers, who were free to accept or ignore the leader’s advice. Finally, and also like Chapter Three, if a game was played with a leader, subjects were informed that the probability of a good leader was either Perfect (1.0), High (0.85), or Low (0.50) (factor 5).
Because the game is repeated, subjects were not randomly assigned to new roles (i.e. tasks) at the outset of each decision period. Rather, subjects maintained the same position throughout the experiment. The monitor in the leadership condition, for example, was the monitor throughout the game and the followers were always followers. Similarly, good leaders in the High or Low probability conditions remained good leaders throughout.

One important commonality with the single-stage games, however, is that in the conditions in which followers were uncertain about the leader's type, followers were informed of the leader's type with certainty after the first decision had been made. This meant that the leader's type was uncertain only during the first round, and was perfectly revealed thereafter. After the first round, the theoretical models lead us to expect that followers will react very differently to good and bad leaders.

Another distinction from Chapter Three is that leaders are always credible at the outset of the experiment, which is to say that in round one, the expected value of following the leader's advice is higher than ignoring the advice in equilibrium. Credibility is a function of the available payoffs, the leader's type, and the probability associated with that type. Unlike the single-stage games, however, in this context followers can learn not only of the leader's type, but also of the leader's behavior, and the corresponding consequences of following or ignoring the leader's advice as the game unfolds.

Finally, and as in Chapter Three, payoffs were generated using a Roth-Malouf procedure at the conclusion of each game.
Experimental Procedure Employed at Texas A&M University

The experiments at Texas A&M University were conducted in a very similar fashion, but there are two important differences. First, factor one was eliminated. All the repeated games run at Texas A&M were indefinitely repeated. This change was made in an effort to bolster the number of observations for the indefinitely repeated games. Second, each group played only one repeated coordination game, rather than a series of such games. Instead, subjects usually played a repeated coordination game, followed (or preceded) by a repeated or single-stage VCM game. If so, the order in which the games were presented to the subjects was randomized.

Predictions
Unfortunately, the experimental procedures and parameters employed here do not permit a full testing of the predictions that can be derived from the theoretical models\(^6\). A detailed discussion and derivation of these restrictions is contained in Appendix 4.2.

Here, I provide a brief overview of how the procedures and parameters employed in the experiments restrict, and at times change, the predictions that are derived from the model.

When a good leader is in play, predictions from the model are easily translated into the experimental design. Good leaders always should send the same color suggestion to each follower, and all followers should obey. Under a bad leader, however, the translation from theory to experimental setting is less straightforward. In the theoretical discussion, I detailed three strategies for bad leaders. In the experimental design, the second of these strategies is not possible as described in the model.

In the experimental design, follower payoffs are unaffected by the color selection of the leader. This renders strategy two obsolete. Under strategy two, a bad leader intentionally matches a subset of the followers to win the loyalties of others. This lowers both the leader's payoffs and those of the disfavored followers in round one. In the present experimental design, this is not possible because 1) follower payoffs are unaffected by matching with the leader, and 2) there are four members of the group (\(n = 4\)) and three choices (\(k = 3\)).

Second, and given the parameters used in the experiment, the basic theoretical prediction for bad leaders under all finitely and all infinitely repeated games is the same. Regardless of whether the game is played for five or 11 rounds, or is played with a .95,

\(^6\) The full derivation of the models was not completed until after the data were collected.
.80, or a .50 discount factor, leaders will employ strategy three in one of two variants. This is a function of the payoff parameters used in the experiment and the length of the finite games or the discount parameters of the infinitely repeated games.

Finally, in round one, both good and bad leaders always are credible under all experimental conditions. This is again a function of payoff parameters and the probabilities of having a good leader.

Despite these limitations, there a number of testable and interesting predictions that can be derived from the models. The first prediction focuses on the repeated trials in which there is no leader to coordinate follower behavior.

*Prediction 4.1.* Subjects will fail to coordinate on a particular equilibrium and their choices will resemble a mixed strategy.

Absent any mode of communication, and given no obvious focal point across choices, subjects should be unable to coordinate their actions. However, we can calculate the expected distribution of color matches among two, three or four subjects. The distribution, assuming all subjects play their mixed strategy, is given as  
\{2: .449, 3: .442, 4: .009\}  This holds whether the setting is a single-stage or repeated game.

The second prediction introduces a leader into the game. When the leader is a known "good" leader (with an incentive to send consistent signals and choose what all followers choose), then coordination rates will increase.
Prediction 4.2. In a coordination game with a known "good" leader, followers will coordinate in their choices.

- Leaders will send a common suggestion to each follower.
- Followers will obey the leader’s suggestion.

This prediction is derived from the fact that good leaders have strong incentives to send the same signal to all followers, and followers have strong incentives to heed the leader’s advice.

When there are two types of leaders, followers do not know which type of leader they have in round one. By the second round, the type of leader in play is fully revealed to followers. How leaders and followers interact in round one, therefore, will be distinct from the manner in which they interact in the remainder of the game.

Prediction 4.3. In round one, leaders will begin with their appropriate long-term signaling strategy and followers will obey the leader’s suggestion.

- Good leaders will send the same signal to each follower.
- Bad leaders will adopt strategy three by sending one follower a unique signal, and two followers a common color.
Prediction 4.3 depends on the credibility of the signal. In round one, both good and bad leaders are always credible. Four types of payoffs were used in this design and both types of leaders are always credible in each ⁷.

In round two (and thereafter), the type of leader in play is fully revealed, leading to another prediction concerning the dynamic of play between leaders and follower after the first round.

*Prediction 4.4:* After round one, leaders will adopt their appropriate signaling strategy, and followers will respond with theirs.

- Good leaders will send a common signal to all followers. All followers will obey.
- If sustainable, bad leaders will rotate which followers are signaled a unique choice. All followers will obey. If rotation is not sustainable, bad leaders will continue to send the favored follower of round one a unique choice, which that follower will obey. Disfavored followers will ignore the leader's suggestion, and mix their strategies instead.

**Results**

*Repeated Coordination Games Absent Leadership*

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⁷ Credibility thresholds are discussed in detail in Appendix 4.2.
The incomplete factorial design of these experiments produces 20 distinct experimental conditions. However, the theoretical models discussed above generate similar predictions and expectations for many of them. In discussing the results, therefore, I will pool most of the conditions and center the discussion around four general games: the no-leader game, certain-leader game, and the uncertain-leader game with high and low probabilities.⁸

Figure 4.1 presents the results for the no-leader condition. Clearly, subjects in these games found coordination to be an ephemeral goal at best, reaching full coordination in only 10 percent of the rounds. Although the observed results are significantly different from those produced by a mixed strategy ($\chi^2 = 10.6$, $\text{DF} = 2$, $P = .005$), the reason stems from the fact that subjects did worse, not better, than expected. This stands in contrast to the results of Chapter Three, in which subjects did slightly better than expected. Curiously, repetition does not appear to automatically bolster the performance of decentralized individuals engaged in a coordination problem. Subjects did slightly better in the infinite games ($\delta = .80$) than in the finite games ($T = 3.08$, $\text{DF} = 29$, $P > .005$), but regardless, mean performance was low (2.8 matches a round in the infinite games vs 2.2 in the finite games). Absent a leader, subjects were no match for the underlying social dilemma.

⁸ Pooling data from several conditions is appropriate here because 1) the theoretical models generate a similar set of predictions for multiple conditions, and 2) results are similar across multiple conditions, as noted in the text.
Repeated Coordination Games under Certain Leadership

Figure 4.2 presents the number of color matches for the group in the certain-leader games. In 78.1 percent of the rounds, the introduction of a leader enabled followers to fully coordinate, a figure that is almost identical to that of the single-stage games (79.7 percent). The introduction of a leader dramatically improves the ability of followers to coordinate over the no-leader condition ($T = -2.0$, $DF = 53.3$, $P > .05$), and results appear to be consistent across manipulations (e.g., there is no significant difference between the finite and repeated games).

There are two results from the certain-leader games that are puzzling, however. First, coordination rates are below 100 percent. Predictions derived from the theoretical models posit that coordination rates should be perfect. Second, there is a significant difference in the certain-leader games in data collected at Texas A&M and data collected at Rice. At Texas A&M, the average number of followers who coordinate in a round is 2.93, just shy of full coordination. At Rice, however, the average number of followers who coordinate in a round is only 2.38 ($T = -5.37$, $DF = 62$, $P > .0001$). Why this significant difference?
Let us first consider the behavior of leaders. Overall, leaders in the certain-leader games sent the same signal to each follower in 89.7 percent of the rounds (with no significant difference between finitely and infinitely repeated games), and in general, followers were quite willing to heed these signals. Figure 4.3 presents the number of times subjects obeyed the leader. In 78.8 percent of the rounds, all three followers obeyed the leader’s counsel.

<Figure 4.3 About Here>

Both of these figures, the rate at which leaders employed their optimal strategy, and the rate at which followers obeyed, provide considerable support for the theoretical models. But we are left again with a number of facts that are incongruous with the theoretical predictions. First, not all leaders employed their optimal strategy. Second, and in spite of their perfect reputation for motive, not all followers obeyed leader’s suggestions. And third, subjects at Texas A&M obeyed at much higher rates than subjects at Rice. In an average round, 2.92 followers obeyed at Texas A&M, and only 2.19 subjects obeyed at Rice (T = -5.41, DF = 56.8, P > .0001).

The answer to these anomalies lies in the behavior of leaders, and far from being a quirk of location, the implication of this behavioral difference for the dynamic of leadership is both dramatic and unanticipated. Data on the certain-leader games from Texas A&M reveals that the mean rate of the variable measuring the leader’s strategy
(coded ‘1’ when the leader adopts the optimal signaling strategy and ‘0’ if not) is 1.0. This means that the leaders in the certain-leader games from A&M never deviated from their optimal strategy. The mean rate of the same variable for the data collected at Rice is .71. Followers, although perfectly confident in the leader’s reputation for motivation in both settings, were much more confident in the leader’s ability to offer appropriate suggestions, or the leader’s competence, at A&M than at Rice.

Moreover, the leader’s performance in early rounds has a significant impact on the group’s performance as the game unfolds. Figure 4.4 presents the average number of color matches amongst the followers in the first five rounds for two groups. The first group, labeled “competent,” was led by leaders who never deviated from their optimal strategy in the first two rounds. The second group, labeled “incompetent,” was led by leaders who sent more than one color to the three followers 1-2 times in the first two rounds. Groups with leaders who displayed an early competence performed significantly better than groups with leaders who initially stumbled out of the gate. Over the duration of the game, the difference between the two groups is both statistically significant and substantively intriguing (T = -4.95, DF = 27.2, P > .0001).

Results are even more dramatic when we compare the followers’ willingness to obey. Figure 4.5 compares the average number of followers obeying the leader in two groups. The first group (labeled competent) contained leaders who never deviated from
their optimal strategy in the first two rounds. The second group (labeled incompetent) contains leaders who sent more than one color to the followers at least once in the first two rounds. Early mistakes proved costly to leaders, and followers were quick to withdraw their trust despite the fact that they knew that the leader was motivated to assist them. Throughout the game, early competent leaders could count on an average of 2.87 followers obeying in a given round, while leaders displaying early incompetence could only convince 2.16 followers to obey ($T = -5.31, DF = 26.3, P > .0001$).

<Figure 4.5 About Here>

These results suggest that for a highly constrained leader to have an impact, her reputation must consist of more than good intentions. It also must consist of competence, and it would appear that followers are just as sensitive to the latter as to the former. To compare the impact of both, I turn now to the uncertain-leadership games.

*Repeated Coordination Game under Uncertain Leadership*

In the uncertain-leader games, followers know that they have leader, but they are uncertain over what type of leader they have in round one. Followers are informed of the leader’s “initial” reputation, the probability that the leader is good (0.85 or 0.50). Also in round one, the leader’s signal always is credible, meaning that given the payoffs available to followers, and the probability of having a good leader, followers expect higher payoffs
for obeying a leader’s signal than for ignoring it. Rates of follower acquiescence, however, were less than 100 percent in round one. Instead, and like the single-stage games, followers appeared to have responded to credibility on an intuitive level by responding to the probability of having a good leader.

If followers were informed that the probability of having a good leader was 0.85, an average of 2.44 subjects obeyed in the first round. If, however, the probability of having a good leader was only 0.50, only 1.94 followers obeyed ($T = -2.04$, $DF = 48$, $P > .04$). Although followers were unable to finely discern credibility thresholds, they did display an intuitive reaction to the initial reputation of the leader. They were much more likely to obey under higher probabilities of having a leader who was motivated to assist the group.

Followers’ sensitivity to the motivation of their leader was not without good cause. Good leaders behaved very differently than bad leaders did. Because the leader’s type is perfectly revealed after round one, and because the motivations and strategies for good and bad leaders are so distinct, I will first discuss the results after round one for good leaders and their followers before turning to the behavior of groups with bad leaders.

In round one, 81.6 percent of good leaders sent the same color suggestion to each follower. After round one, 83.3 percent of good leaders adopted their optimal strategy. While providing a fair amount of support for prediction 4, results are far from perfect.

Followers, in turn, did not always heed their leader’s advice. Figure 4.6 presents the number of followers who obey the leader after the first round. Recall that after the first decision, followers know the leader’s type with certainty, and, therefore, followers
should obey the leader at high rates. However, this was not the case. In only 60 percent of the rounds did all three followers in the group obey the leader. The result of leaders failing to suggest the same color to each follower, and followers hesitating to follow a leader’s advice, is presented in Figure 4.7. Only 54.3 of the rounds after round one had groups fully coordinating, well below the perfect rate posited by prediction 4. What accounts for this low level of follower trust and coordination?

<Figure 4.6 About Here>

<Figure 4.7 About Here>

Much like the certain-leader games, much of the discrepancy stems from early leadership stumbles. Figure 4.8 compares the number of rounds in the which a leader is obeyed for two groups: those with a leader displaying early competence, and those with a leader displaying less competence. Leaders who show an early sense of competence are much more likely enjoy follower support than leaders who initially stumble are. The former enjoy an average of 2.87 followers obeying per round, while the latter are only able to convince an average of 1.84 followers to obey (T = -5.21, DF = 26.3, P > 0001). Early leadership behavior is determinative of later levels of follower trust.

<Figure 4.8 About Here>
The impact of early miscues for coordination is presented in Figure 4.9. Groups with an early competent leader fully coordinate in 62.4 percent of later rounds, while groups with a leader displaying early incompetence fully coordinate in only 27.3 percent of later rounds (\( T = -4.95, \text{DF} = 27.7 \ P > .0001 \)). It seems, then, that groups that stumble early never fully recover. Although both types of groups, those with early competent and incompetent leaders, do not perform as well as expected, competent groups perform much better. Early stumbles lead to later falls.

<Figure 4.9 About Here>

The results for groups with bad leaders are less straightforward. In round one under all conditions, bad leaders had incentives to employ strategy three, in which one follower was signaled a unique element, two followers were sent a common element, and the leader chose the third element for herself. In all groups, strategy three had a higher expected return than strategy one or two did. Under strategy one, a bad leader would send the same color signal to all followers, and then choose something else. Under strategy two, a bad leader would send all three followers a unique color suggestion, and then intentionally match one of the followers.

In contrast to Prediction 4.3, only 25 percent of bad leaders adopted strategy three in the first round. Twenty-five percent chose strategy two, and fully 50 percent of bad leaders chose strategy one. Because of the relatively small ‘n’ in each of these groups
(i.e., six leaders chose strategy one, three chose strategy two, and three chose strategy three), as well as the obviously path dependent nature of the data, I will examine each of the three groups in detail, describing what happened in later rounds for each.

Of the six bad leaders who chose strategy one in the first round, three must be discarded from further analysis because their game lasted only one iteration. All three remaining leaders (who will be labeled Leader A, B, and C here for convenience) chose an appropriate color in the first round, meaning that they chose a color that was distinct from what they signaled. In subsequent rounds, most strategy-one leaders maintained this strategy throughout. Leader A always stuck with strategy one, Leader B did so in 13 of 18 rounds, and Leader C did so for six of 10 rounds.

No matter what strategy they tried in later rounds, bad leaders who employed strategy one in round one should not be credible thereafter. In Group A, no follower ever obeyed the leader again. Group C contained followers who each obeyed the leader an average of six of 10 rounds, while Group B contained followers who each obeyed in an average of 10 of 18 rounds. In these groups, followers “over trusted” the leader relative to the leader’s initial strategy selection. Followers should have learned never to trust the leader again after the leader’s initial signals, yet in two of the three groups, followers were hesitant to withdraw their trust.

Of the three bad leaders who adopted strategy two, one must be discarded for an insufficient number of later rounds. Of the remaining two groups (D and E), a rotation equilibrium was sustainable in Group D, while rotation was not sustainable in Group E (i.e., in group D, the expected value of rotating was greater than the expected value of
mixing—see Appendix 4.2 for details). Leader D did not attempt to rotate a unique signal among the followers, however, but instead sent each follower a unique signal in each subsequent round. Not surprisingly, the followers always obeyed, and were rewarded with the highest payoff. Leader D, meanwhile, was content with a series of second-best payoffs.

In Group E, rotation was not sustainable. Given that Leader E chose strategy two in the first round, his or her best option was to just to stick with it, which Leader E did in all five of the subsequent rounds. Despite being handed a profitable opportunity, Group E followers “under trusted” the leader, with each follower obeying the leader on average in only two of five rounds.

Finally, three bad leaders employed the predicted strategy in the first round, strategy three. Of these three, one must be discarded for an insufficient number of later rounds. Of the remaining two groups (F and G), both leaders chose the optimal strategy in round one, employing signaling strategy three while picking a unique color. Rotation was sustainable in Group F and not sustainable in Group G. There is some indication that Leader F attempted a rotation scheme. Rotation would require sending two colors to the three followers in each round, rotating the unique suggestion fairly among the followers. In five of the eight rounds after the first, Leader F sent two color suggestions to the followers. But Leader F neglected to fairly rotate the unique signal, sending it to one follower three times, and only once to the other two followers. Moreover, in three rounds, Leader F employed signaling strategy one, sending the same color suggestion to all three followers. If obeyed, this would net the followers a low payoff, killing follower-
leader trust immediately. The evidence for rotation, then, is at best slim. In response to this varied effort, followers of Group F each obeyed on average in only three of the eight rounds.

In Group G, rotation was not sustainable, which meant that the leader should have favored the same follower throughout the experiment. Leader G accomplished this task perfectly, always favoring the same follower with a unique signal. The favored follower, apparently recognizing his or her privilege, always obeyed. But the disfavored followers over trusted the leader, each obeying in three of four rounds after the first, when they would have been better off mixing their selections.

The evidence, then, for predictions three and four is mixed at best. Although the vast majority of good leaders adopted the appropriate signaling strategy, only 25 percent of bad leaders chose theirs. In groups with a bad leader, followers at times over trusted and at other under trusted their leader. Given the complexity of these strategies, however, this is not terribly surprising. What is much more clear is that followers reacted to good and bad leaders differently when the leader's type was perfectly revealed. Figure 4.10 compares the average number of followers obeying the leader after round two.

Followers are much more willing to trust good leaders once they learn of the leader's motivation. After round one, an average of 2.45 followers obeyed a good leader in a given around, while only 1.76 followers obeyed bad leaders ($T = 5.28, DF = 292, P > .0001$). Moreover, this disparity appears to widen over time. With each passing round, good leaders receive greater levels of trust, while the relationship between bad leaders and their followers sours.
The trust disparity between groups with good and bad leaders affects the ability of leaders to coordinate the followers. Figure 4.11 presents the average number of followers who coordinate under good and bad leaders. While 2.46 followers coordinate on average under good leaders, only 1.96 followers do so under bad leaders (T = 5.20, DF = 292, P > .0001). Like trust, the disparity widens over time, with the effectiveness of good leaders growing and the effectiveness of bad leaders declining. Figures Ten and Eleven reaffirm the importance of leadership reputation.

Conclusion

The theoretical models of this chapter receive mixed support. Coordination is difficult without a leader (Prediction 4.1) and the introduction of a known good leader does improve the performance of followers significantly (Prediction 4.2). Most good leaders adopt a helpful signaling strategy most of the time, and followers are likely to obey. Under uncertainty, bad leaders behave in ways that are quite distinct from good leaders, although they do not always conform with the theoretical expectations (predictions 3 and 4). When uncertain, followers are more willing to offer the leader their
trust under higher probabilities of having a good leader. When the leader's type is revealed, followers become increasingly likely to trust and coordinate under good leaders, and less and less likely to do so under bad leaders.

Most of the results reported here conform to and support the findings of Chapter Three. In general, the introduction of repetition appears to worsen follower performance, and the reason behind this trend stems from early leadership mistakes. Followers are very sensitive to early leadership miscues, trusting a leader who displayed high levels of early competence at much higher rates than leaders who initially stumbled. Although this finding was unanticipated by the theoretical models, it is both significant and intriguing. Leadership appears to be extraordinarily path dependent, and leadership success, as well as the nature of the leader-follower relationship more generally, is highly contingent upon getting off on the right foot.
Figure 4.2

Certain-Leader Games
Number of Color Matches

![Bar chart showing the number of color matches for different number of matches (1, 2, 3). The x-axis represents the number of matches, and the y-axis represents the percentage. Two types of bars are shown: Null (striped) and Observed (solid). The chart indicates that the number of color matches increases as the number of matches increases.]
Figure 4.3

Certain-Leader Games
Number Obeying the Leader
Figure 4.4

Certain-Leader Games
Average Number of Matches by Early Competence of Leader
Figure 4.5

Certain-Leader Games

Average Number Obeying the Leader by Leader's Early Competence

Number Obeying

Round

Competent

Incompetent
Figure 4.6

Uncertain-Leader Games
Period >= 2
Number Obeying Good Leaders

![Bar chart showing the number of people obeying good leaders for different periods, with percentage on the y-axis and number obeying on the x-axis. The periods are 0, 1, 2, and 3, with 30% for 0, 20% for 1, 40% for 2, and 60% for 3.]
Figure 4.7

Uncertain Leader Games
Period >= 2
Number of Matches under Good Leaders

- Observed
- Null
Figure 4.8

Uncertain-Leader Games
Period >= 2
Good Leaders

Number Obeying the Leader by Early Leader Competence

- Competent
- Incompetent
Figure 4.9

Uncertain-Leader Games
Period >= 2
Good Leaders

Number of Matches by Early Leader Competence

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</table>
Figure 4.10

Uncertain-Leader Games
Period >= 2

Average Number Obeying Good and Bad Leaders
Figure 4.11

Uncertain-Leader Games
Period $\geq 2$

Average Number of Matches under Good and Bad Leaders

![Graph showing the average number of matches under good and bad leaders over rounds. The graph compares the number of matches with solid and dashed lines for good and bad leaders, respectively. The x-axis represents the round, ranging from 1 to 11, and the y-axis represents the number of matches, ranging from 0 to 3.]
Appendix 4.1

The data for this chapter are drawn from 11 groups of eight subjects collected at Rice University, and six groups of eight subjects collected at Texas A&M University. Observation counts are at the group-round level (i.e., a group's decision in a given round).

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<thead>
<tr>
<th>Rice University</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>No Leader</td>
<td>Certain Leader</td>
</tr>
<tr>
<td>(40)</td>
<td>(52)</td>
</tr>
<tr>
<td>Finite</td>
<td>Infinite</td>
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<tr>
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<td>.80 Discount</td>
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<td>(35)</td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>δ=.95: (37)</td>
<td>δ=.95: (21)</td>
</tr>
</tbody>
</table>
Appendix 4.2

Derivation of Credibility Thresholds and Bad Leaders’ Strategy

Below, I present the calculations for the credibility of leaders’ signals under conditions of uncertainty in round one, as well as the calculations behind the identification of bad leaders’ strategies. In so doing, I discuss in detail the specific features of the experimental design that prevent a full testing of the predictions derived from the theoretical model.

Figure 4.1 presents an example of a follower screen under conditions of uncertainty.
**Figure 4.2.1:**

Your Earnings Based on Number of Others Choosing Same Color:

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orange</td>
<td>4</td>
<td>7</td>
<td>29</td>
</tr>
<tr>
<td>Yellow</td>
<td>4</td>
<td>7</td>
<td>29</td>
</tr>
<tr>
<td>Green</td>
<td>4</td>
<td>7</td>
<td>29</td>
</tr>
</tbody>
</table>

Type W
Likelihood = .85

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</thead>
<tbody>
<tr>
<td>Orange</td>
<td>29</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Yellow</td>
<td>29</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Green</td>
<td>29</td>
<td>7</td>
<td>4</td>
</tr>
</tbody>
</table>

Type Z
Likelihood = .15

Choose One:

Orange
Yellow
Green
OK

A more general presentation of the matrices used in the uncertainty conditions is presented in Figure 4.2.

**Figure 4.2.2:**

Number of Followers Choosing the Same Color

<table>
<thead>
<tr>
<th>0</th>
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<th>2</th>
<th>3</th>
<th>4</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>z</td>
<td>y</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b</td>
<td>c</td>
<td>d</td>
<td></td>
</tr>
</tbody>
</table>

Good Leader
Bad Leader

Let \( w > x > y > z \). Let \( a > b > c > d \).
The shaded box in the first column constitutes a "Bad" leader's payoff if she matches no other follower. The shaded box in the fifth column is a "Good" leader's payoff if she matches all the other followers. Only the leaders view the shaded boxes.

*Bad Leaders' Strategies*

Assume that the leader's signal is credible in round one, and that \( n = 4 \), and \( k = 3 \).

If a bad leader adopts strategy one, she can expect the following payoff over the course of the game (in this section, payoffs for the infinitely repeated games are given on lines numbered by odd numbers, and payoffs for the finitely repeated games are given on lines numbered by even numbers)

\[
a + \frac{\delta (0.30a + 0.44b + 0.22c + 0.04d)}{(1 - \delta)}
\]

(4.2.1)

\[
a + (T - 1) (0.30a + 0.44b + 0.22c + 0.04d)
\]

(4.2.2)

In the first round, the leader sends a common color suggestion to all the followers who all obey. This nets the bad leader 'a' in the first round, and the discounted sum of mixing her strategy in all subsequent rounds with the followers. In the second and following rounds, the followers will mix, as to continue to obey a bad leader using strategy one nets a string of 'd's', the worst payoff.
Now suppose the leader adopts strategy two, in which she sends unique color suggestions to two followers, and tells the third to pick the remaining color, which she also selects. In the theoretical models, the disfavored follower’s payoff would be lowered as a result of matching a leader. In all future rounds, this follower would react accordingly by never obeying the leader again. In the experiments, however, the disfavored follower’s payoff is unaffected by matching the leader. In fact, in round one under strategy two, the disfavored follower gets the highest payoff possible (‘b’) along with the favored followers.

A bad leader employing strategy two, then, is left with a problem that is unanticipated by the theoretical models (in fact, it is a problem that cannot occur under the models). What to do with three followers in round two who all got the highest payoff in round one (and who will therefore obey again)? Because this scenario is not possible under the models, they are of little help in this scenario. I turn instead to intuition.

A bad leader has two plausible choices here. First, she can continue to do the same thing as she did in round one. This will produce the following payoff over the course of the entire game:

\[
\frac{b}{(1 - \delta)} \quad (4.2.3)
\]

\[
T \cdot b \quad (4.2.4)
\]
Or, given that the leader has all three followers willing to obey again, a factor that is impossible under the theoretical models under strategy two, she could attempt to rotate which follower is sent a unique signal and which two are sent the same signal (while reserving one unique color for herself). This would yield the leader the following payoff over the course of the game:

\[
b + \frac{\delta a}{(1 - \delta)}
\]  

(4.2.5)

\[
b + (t - 1) a
\]  

(4.2.6)

Finally, consider a bad leader who adopts strategy three, in which she sends one follower a unique choice, two followers a common choice, and chooses the remaining color for herself. In round one, the leader would receive the highest payoff, ‘a’. In round two, the leader would continue to favor the follower who was sent a unique color in round one, ensuring that she never matches that individual. The disfavored followers would mix their strategies. The payoff for the leader under this case would be:

\[
a + \frac{\delta (.44a + .44b + .11c)}{(1 - \delta)}
\]  

(4.2.7)

\[
a + (T - 1) (.44a + .44.2 + .11c)
\]  

(4.2.8)
Alternatively, the leader could attempt to rotate who among the followers was favored in round two. If successful, such a strategy would net the leader over the course of the game:

\[
\frac{a}{1 - \delta}
\]  

(4.2.9)

\[Ta\]  

(4.2.10)

Which strategy will the bad leader adopt? Obviously, a bad leader would like to adopt (9) or (10), as it produces the highest payoff in each round. Such a strategy is contingent on the leader’s signal being credible in round one (which it always is- see below) and on followers finding it worthwhile to accept the rotation scheme in all subsequent rounds rather than mix their strategies. As it turns out, given the values of b, c, d and \( \delta \) used in the experiments, followers will view the expected value of rotating as greater than the expected value of mixing in only 84 of 206 rounds of the infinitely repeated games. In the finitely repeated games, followers will view the expected value of rotating as greater than the expected value of mixing in 89 of 141 rounds. In the rounds in which rotation is possible, then, bad leaders should adopt the strategy associated with payoffs (9) and (10): Send one follower a unique color signal in round one, and two followers a common color, while selecting the third for herself. In subsequent rounds,
always pick a unique color while fairly rotating who among the followers gets the remaining unique choice.

Note that a rotation equilibrium would not unravel in the finitely repeated games. The leader gets the maximum payoff in each stage, and therefore has no incentive to change. The same holds for the favored follower in the last round. The disfavored followers of the last round would like to do something, but cannot. First, they don't know if the other disfavored follower will stay put or switch to a different color (and they can't communicate). Second, even if the one disfavored follower switches and one stays put, the switching follower will get the same payoff because he will match the leader or the favored followers. Rotational equilibria in the finitely repeated games will not unravel.

In 122 of the 206 rounds of the infinitely repeated games, and 52 of the 141 rounds of the finitely repeated games, however, a rotation equilibrium is not sustainable. The followers would rather mix after the first round. In these games, the leader will adopt the strategy associated with payoff (7) and (8), given the parameters used in the experiment. This entails sending one follower a unique color choice in round one, sending two followers a common choice, and picking the third for herself. In all subsequent rounds, send the same favored follower a unique choice and pick something else. Note that although the strategy associated with payoffs (5) and (6) are higher than (7) or (8), they are not sustainable in these rounds.

Note that the leader will adopt one of the two variants of strategy three in all three δ conditions, and for the short and long term finite games (although these parameters are
important in determining in which rounds rotation is sustainable). In this sense, a
"pooling" hypothesis exists across several experimental manipulations.

In sum, in these experiments, a leader should always adopt strategy three. If
possible, she should rotate. If not, she should continue to favor the follower who was
favored in round one.

Leadership Credibility

For followers in these experiments, three considerations must be made. First,
before the leader's type is revealed, is the leader's signal credible? Second, if the leader's
type is revealed and it is 'bad,' is it worthwhile to accept the leader's rotation scheme? If
not, will favored followers continue to obey? In this section, I establish the answer to
these questions.

Followers know that in round one, the leader will adopt strategy three (as all
parameters used to make that calculation are, in theory, common knowledge. In the
experiments, in addition to the difficulty of the calculation, however, followers never
observe parameter 'a'). Under strategy three, followers have a .33 probability of being a
favored follower, assuming that the leader randomly selects which follower will be
favored. If so, followers can expect

\[ p(x) + (1 - p)(.33b + .67c) \]  

(4.2.11)
if they obey the leader in round one. If the leader is good (given by probability ‘p’), they expect the full coordination payoff under good leaders. If the leader is bad, they know they have a .33 probability of being the favored follower (and thereby getting the high payoff of ‘b’) and a .67 probability of being a disfavored follower (and thereby getting a payoff of ‘c’).

If in round one they ignore the leader’s signal and mix their strategies instead, they can expect

\[ p (.44z + .44y + .11x) + (1 - p) (.44b + .44c +.11d). \]  \hspace{1cm} (4.2.12)

If (11) is greater than (12), the leader is credible. For the parameters used in this experiment, all leaders are always credible in round one.

Now suppose the followers are in round two, and the leader’s type is revealed to be bad. Followers will prefer a rotation scheme when its expected value is greater than that of mixing, which is true whenever (13) is greater than (14), and in the finite case, whenever (15) is greater than (16):

\[ \frac{(.33b + .67c)}{(1 - \delta)} \]  \hspace{1cm} (4.2.13)
\[
\frac{(44b + 44c + .11d)}{(1 - \delta)} \quad (4.2.14)
\]

\[
(T - 1) (.33b + .67c) \quad (4.2.15)
\]

\[
(T - 1) (.44 + .44c + .11d) \quad (4.2.16)
\]

Finally, if rotation is not sustainable, a leader's signal in round two and thereafter is weakly credible to the favored follower. In both cases (obeying vs mixing) a favored follower expects (17) or (18):

\[
\frac{(44b + 44c + .11d)}{(1 - \delta)} \quad (4.2.17)
\]

\[
(T - 1) (.44.2 + .44c + .11d). \quad (4.2.18)
\]

If he continues to obey, a favored follower expects these payoff because the two disfavored followers are mixing, and will probabilistically land on his color choice. The expectations are the same if he obeys the leader's signal.
VOLUME II

Information and Leadership in Laboratory and Field

by

Carl M. Rhodes
Chapter Five

Leaders and Followers in a Single-Stage VCM Game

In May of 1993, the Democratic party in the House was charged with rescuing a faltering Clinton presidency. Stumbling badly after defeats on an economic stimulus package and an initiative on gay rights in the military, the Clinton administration was pinning its hopes on a reconciliation bill, and turned to the House leadership for help. The bill, an unpopular mix of tax increases and spending cuts, was disliked on both ends of the political spectrum. With the Republicans defecting in mass, Speaker Foley and the Democratic leadership knew that for the bill to pass, the Democrats would have to carry the load.

Speaker Foley pitched the bill in explicitly partisan terms. Although acknowledging that the vote would be politically costly to many of his colleagues, he pleaded for yea votes on the grounds of party. If the Democrats could stand together and pass this bill, the party would benefit from an improved public image: The Democrats would be known as a party that could stand, govern, and make the tough decisions. Shouting that “this is a time to stand and deliver; this is a time to justify your election,” (Hager and Cloud 1993) Foley and the leadership convinced enough Democrats that the tradeoff was worth it. Each would suffer the personal consequences of making a politically tough vote in exchange for a collective benefit: an electorally attractive party label.

The setting that faced Speaker Foley and the Democrats in this context was more contentious than the context described in Chapter Three. Although all would like to
provision a public good, here a party label, each member has strong incentives to free ride on the contributions (i.e., votes) of others. Discrete public good problems represent the more contentious and difficult of political issues. As in situations characterized by coordination problems, people engaged in a collective action problem have common interests: each would prefer for the good to be provided. But unlike coordination problems, in which individuals are indifferent to how they achieve a common end, individuals in a collective action problem have strong preferences over the means. Each wishes to shirk in hopes that others will provide the good with costly donations of time, money, or effort.

The question before us is whether a leader, one who can only cajole, plead, and suggest, can enable a set of followers to provide a public good. We shall see that this context is more difficult for leaders than that of a coordination problem, and that Speaker Foley’s success might be more the exception than the rule.

**Discrete Public Good Problems**

Before we consider the impact of leadership, we must formally specify the new strategic context in which leaders and followers will interact. I begin by specifying a discrete public good game with a threshold\(^1\).

Consider a game \( \Gamma_i = (N) \) in which \( N \) individuals choose between two pure strategies \( s_i = (0,1) \). Each actor may choose to contribute to a public good \((s_i = 1)\) or

---

\(^1\) These games are common in the experimental economics literature. In this section, I follow the exposition of Palfrey and Rosenthal (1984).
may choose to withhold his or her contribution \((s_i = 0)\). Let the number of players who contribute to the good be given by (1):

\[
\left( \sum_{i=1}^{N} s_i \right)
\]  

\(5.1\)

Let \(T\) denote the minimum number of players who must contribute to provide the good \((N \geq T > 0)\). Let the value of \(T\) be common knowledge. If \(\left( \sum_{i=1}^{N} s_i \right) \geq T\), the good is provided. If \(\left( \sum_{i=1}^{N} s_i \right) < T\), the public good is not provided.

Let the payoffs for this game for \(\forall i \in N\) be given as \(u_i = f(\omega)\), where \(f\) represents a monotonic increasing function and \(\omega\) represents the set of possible outcomes:

\[
\omega = \begin{cases} 
(1 - c) & \text{if } (s_i = 1) \text{ and } (\bullet) \geq T, \\
1 & \text{if } (s_i = 0) \text{ and } (\bullet) \geq T, \\
-c & \text{if } (s_i = 1) \text{ and } (\bullet) < T, \\
0 & \text{if } (s_i = 0) \text{ and } (\bullet) < T.
\end{cases}
\]

\(5.2\)

Above, \((\bullet)\) represents \(\left( \sum_{i=1}^{N} s_i \right)\), or the total number of players who contribute. ‘\(c\)’ represents the cost to the player of contributing to the public good. ‘\(1\)’ is the value of the public good to each player if it is provided, and ‘\(0\)’ represents its value if it is not. Let \(0 < c < 1\).
The strategic form of the game is as follows:

**Normal Form of a Discrete Public Good Game**

<table>
<thead>
<tr>
<th>$u_i$ if $\left( \sum_{j=1, \forall j\neq i}^N s_j \right) &gt; T - 1$</th>
<th>$\left( \sum_{j=1, \forall j\neq i}^N s_j \right) &lt; T - 1$</th>
<th>$\left( \sum_{j=1, \forall j\neq i}^N s_j \right) = T - 1$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$(s_i = 1)$</td>
<td>$(1 - c)$</td>
<td>$(-c)$</td>
</tr>
<tr>
<td>$(s_i = 0)$</td>
<td>$1$</td>
<td>$0$</td>
</tr>
</tbody>
</table>

Here, each player $i$ (the row player) is playing the game against a number of others (whose aggregate decisions are represented in columns). Column two represents a case in which no matter what $i$ does, contribute ($s_i = 1$) or not contribute ($s_i = 0$), the good is provided. In this situation, $i$ clearly is better off not contributing because she gets the benefit of the good (1) without having to pay the cost of providing it (1-c). Column three represents the case in which regardless of $i$'s action, the provision of the good will fail. Here, $i$ again is better off not contributing (0) than chipping in toward a lost cause (-c).

The only circumstance in which it is in $i$'s interest to contribute is represented in column four. Here, $i$'s contribution will make or break the provision of the good. If $i$ contributes, she receives $(1 - c)$, the benefit of the good minus the cost of her contribution. If she does not, she loses the value of good but does not have to bear the cost of contributing. Because $(1 - c) > 0$, $i$'s preference in this case is to contribute.
Note that the key decision for each individual in this game is whether or not his or her contribution is vital to the creation of the good. If it is not, the game is simple: do not contribute because one's costly contribution will not matter either way.

Propositions 5.1 and 5.2 describe the equilibrium properties of this game.

**Proposition 5.1:** In $\Gamma_1$, there are $\binom{N}{T}$ equilibria in pure strategies.

If $T = 1$, there are $N$ pure strategy equilibria, each with $(s_i = 1)$ and $(s_j = 0)$ for all $j \neq i \in N$. $i$ contributes because $(1 - c) > 0$. All $j$ who do not contribute do so because $1 > (1 - c)$.

If $T > 1$, there are $\binom{N}{T}$ equilibria. The contributors contribute because $(1 - c) > 0$. The shirkers withhold their contributions because $1 > (1 - c)$.

**Proposition 5.2:** If $T > 1$, $\left( \sum_{i=1}^{N} s_i \right) = 0$ is always an equilibrium.

If all $j \neq i$ do not contribute, and $T > 1$, then $i$'s best response is to withhold her contribution as well, because $0 > (-c)$.

These same strategic considerations faced each Democratic member of the House in 1993. Given the political pain associated with casting a yea vote, the key calculus
involved the number of others who would vote for the bill as well. If the bill was a sure-
thing or a sure-loss, each member would refrain from casting the tough vote (because
either way, an individual vote wouldn’t matter). Each member would vote for the bill
only if he or she believed that the vote would be very close to the minimum necessary for
passage. Only then would the member find it worthwhile to cast the tough vote.

Without leadership, then, beliefs about the necessity of one’s contribution are the
key parameter of this game. Assume that each individual begins the game with a set of
beliefs over 1) whether her contribution will be critical (p) or not (1 - p), and 2) whether
or not, given that her contribution is not critical, the good will be created (q) or not (1 - q).
Let \( 0 \leq p, q \leq 1 \).

Each player will use these beliefs to decide whether or not to contribute in \( \Gamma_i \).
The expected value of contributing is given by

\[
Ev(s_i = 1) = p(1 - c) + (1 - p)(q(1 - c) + (1 - q)(-c)).
\]

The expected value of withholding one’s contribution is given by

\[
Ev(s_i = 0) = p(0) + (1 - p)(q(1) + (1 - q)(0)).
\]

Setting these two equations equal to one another, a player \( i \) is indifferent between
contributing and withholding when \( p = c \). \( i \) prefers to contribute when \( p > c \), and
prefers to withhold when \( p < c \).
Note that the q term drops out because, regardless of whether the good is provided, if i is not critical to its production, she will not contribute. The key relationship then becomes whether i’s belief that her contribution is vital outweighs the cost of contributing to the good itself.

If all i and j in N have identical c terms, then everyone in the game will either mix their pure strategies or not contribute (because everyone contributing is only an equilibrium if N = T). If the c term varies across actors (and this variation is common knowledge), then some players will contribute, some will mix, and some will withhold their contributions.

The key relationship for each actor will be between the c term and the p term. c represents the costs of contributing, while p represents the belief that an individual’s contribution is critical to the creation of the good. p itself will be determined by the number of other players who will contribute, the number who will shirk, and the number of mixers (and their probability of contributing or withholding).

For any player i who is indifferent between contributing and shirking, p = c: the belief that her contribution will be critical equals her cost of contributing. The value of p is given as

\[
p = \left( \frac{N - C - S - 1}{T - C - 1} \right)^{T-C-1} \left( 1 - r \right)^{N-T-1} = c\tag{5.3}
\]

where
\( N = \) number of players in the game,
\( C = \) number of players who choose to contribute as a pure strategy,
\( S = \) number of players who choose to shirk as a pure strategy,
\( r = \) probability of \( i \) playing contribute.

The middle of this equation gives the probability that \( i \)'s contribution will be critical. The combination denotes the number of ways in which \( i \)'s contribution can be critical. Of the \( N \) players, \( C \) will contribute and \( S \) won't, and \( i \) (-1) is mixing. \( i \) can be critical in this environment when there are exactly \( (T-C-1) \) pure strategy contributors. \( r \) is the individual probably that another "mixer," such as \( a \), contributes. For \( i \) to be critical, exactly \( (T-C-1) \) other mixers have to contribute, and \( (N-T-1) \) mixers have to withhold.

A similar logic determines the \( p \) term for pure-strategy contributors and shirkers. For a pure-strategy contributor \( j \), \( p > c \), which means that the following term is greater than \( j \)'s cost of contributing:

\[
\left( p = \binom{N-C-S}{T-C} r^{T-C} (1 - r)^{N-T-S} > c \right).
\]  
(5.4)

For a pure-strategy shirker \( k \), \( p < c \), which means that the following term is less than \( k \)'s cost of contributing:

\[
\left( p = \binom{N-C-S}{T-C-1} r^{T-C-1} (1 - r)^{N-T-S+1} < c \right).
\]  
(5.5)
These results are summarized in Proposition 5.3:
Proposition 5.3: \( \{C, S, r\} \) describes an equilibrium of \( \Gamma_1 \) where \( C \) represents the number of contributors, \( S \) the number of shirkers, and \( r \) the probability with which all remaining members contribute.\(^2\)

It might be useful to place the properties of \( \Gamma_1 \) in the context of the introductory example. Each member of the Democratic party wanted the bill to pass, but due to the cost of a yea vote, she also wanted the bill to pass on the backs of others. If a member knew with certainty that her vote would make or break the bill, she would vote for it. The collective problem, however, was that members didn’t know this for certain. Rather, they struggled to discern whether enough other people would vote for it, or whether their own votes were needed (a costly activity in and of itself). If we assume that each member bears a fixed cost for contributing, the likely result absent leadership is grossly inefficient, and likely to result in a collective failure. We would expect, at best, a probabilistic distribution over outcomes, or perhaps even a vote in which no one votes for a bill that all would like to pass.

Where, then, do these beliefs (i.e., “p terms”) come from? In real life, they are likely to come from a number of sources: past experience, the rumor mill, or more or less systematic efforts to gain information (i.e., “schmoozing”). Irrespective of their origin, it seems plausible to suggest three of their characteristics: In institutional settings of reasonable size and complexity, it is likely to be costly to refine one’s beliefs about the likely actions of others. Second, if left to their own devices, decentralized individuals may or may not be able to form accurate “p terms.” Third, the process by which

\(^2\) Obviously, there are many equilibria in \( \Gamma_1 \). In addition to full shirking and efficient provision, there are
individuals attempt to convince each other that they will or will not contribute is likely to be time-consuming and inefficient, as each individual has strong incentives not only to shirk, but also to deceive. The question becomes: Can a leader, as an institutionally imposed solution to these problems, enable a set of individuals to act?

Consider a second game $\Gamma_2 = (N, S)$, in which an additional actor with a special role, a leader, is added to the basic game ($\Gamma_1$). The leader begins the game by privately suggesting a pure strategy to each actor: $S = \{s_1, s_2, \ldots, s_n\}$. The leader suggests to each that he either contribute ($s_i = 1$) or not contribute ($s_i = 0$) to the party label. Each actor knows only his own signal, and does not know what the leader told the others. After each follower receives his private signal, all followers choose to contribute or to withhold. Once all followers have made this choice, the outcome is revealed to all actors (although signals remain private). At the end of the game, each player learns 1) whether or not the good was provided, 2) how many players chipped in, and 3) who chipped in and who didn’t.

Let the payoffs for the leader be defined as $u_{gl} = f(\bullet)$, where $f$ represents some monotonic increasing function and $\bullet$ represents $\left(\sum_{i=1}^{N} s_i\right)$, or the total number of players who contribute. If $\left(\sum_{i=1}^{N} s_i\right)$ is greater than or equal to $T$, the leader receives the “big” payoff: 1. If $\left(\sum_{i=1}^{N} s_i\right)$ is less than $T$, the leader receives the “small” payoff: 0.

Given these interests, how should the leader proceed, and how will the followers react?

---

a host of symmetric and asymmetric mixed strategy equilibria as well.
**Proposition 5.4:** Let \( \{ \sigma^*, C^*, S^* \} \) describe an equilibrium of \( \Gamma_2 \), where \( \sigma \) denotes the number of (weakly) credible contribute signals (\( \sigma^* = T \)), \( C \) denotes the number of contributors (\( C^* = T \)), and \( S \) the number of shirkers (\( S^* = N - T \)).

A leader’s task is to select the number of contribute \( (s_i^* = 1) \) signals to send to followers. The complete set of possible signaling vectors may be usefully partitioned into three subsets. A leader may send a ‘low’ number of contribute signals \( \{0, T - 1\} \), exactly \( T \) contribute signals, or a ‘high’ number of contribute signals \( \{T + 1, N\} \).

Assume the leader selects a ‘low’ vector of signals (i.e., the number of contribute signals is in the interval of \( \{0, T - 1\} \)), all individuals obey, and payoffs and results are revealed. The leader’s payoff in this example is \( f(0) \). Any follower \( i \) who contributed receives \( f(-c) \), and any follower \( j \) who shirks receives \( f(0) \). *Ex post*, if given an opportunity, both the leader and any \( i \) would unilaterally switch their strategies. *Ex post*, the leader would switch to sending \( T \) or more contribute signals. If all followers obeyed, the leader would earn \( f(1) \).

Any \( i \) who played \( (s_i = 1) \) also would unilaterally switch to \( (s_i = 0) \). Such a switch would improve \( i \)’s payoff to \( f(0) \). A low number of contribute signals never is in equilibrium, because leader and follower strategies are not best replies. Both the leader and a subset of the followers would unilaterally prefer to switch their strategies *ex post*, given the opportunity.
Now assume that the leader selects a ‘high’ vector of signals, all individuals obey, and payoffs and results are revealed. The leader’s payoff in this example is \( f(1) \). A follower \( i \) who contributed would receive \( f(1-c) \), and a follower \( j \) who shirked would receive \( f(1) \). *Ex post*, any \( i \) would have a strong incentive to unilaterally switch his strategy to \( (s_i = 0) \), as his own contribution is superfluous. In this sense, a high signaling vector is not in equilibrium. Leader and follower strategies are not best replies, and given an opportunity, at least a subset of actors unilaterally would switch their strategies.

Finally, consider the case of a leader who sends exactly \( T \) contribute signals. In this case, the leader’s payoff is \( f(1) \). All contributing \( i \) receive \( f(1-c) \), and all shirking \( j \) receive \( f(1) \). *Here, leader and follower strategies are best replies to each other.* *Ex post, neither the leader nor the followers have an incentive to unilaterally switch their strategies.* The leader earns her maximum payoff, and therefore has no incentive to switch. Moreover, unlike the case of a high signaling vector, the leader does not risk tempting would-be contributors into shirking: Every follower \( i \) who plays \( (s_i = 1) \) is critical to the good’s provision. Should he unilaterally switch, he only could lower his payoff to \( f(0) \). Similarly, every follower \( j \) who plays \( (s_i = 1) \) is superfluous to the good’s provision. Should he unilaterally switch, he only could lower his payoff to \( f(1-c) \). It is in this sense that \( \{ \sigma^*, C^*, S^* \} \) describes an equilibrium of \( \Gamma_2 \).

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3 There are several points to note here. First, Proposition 5.4 does not exhaust the full range of equilibria of \( \Gamma_2 \). In addition to asymmetric equilibria, a host of additional equilibria exist in which the leader’s cheap-talk signal is completely ignored, or heeded in a perverse fashion. For example, the leader could tell all followers to shirk. In response, \( (N-T) \) followers could obey, while \( T \) followers spontaneously could decide to contribute. Due to the improbability of these outcomes, however, I focus on positive-
The essence of leadership in this context may be succinctly stated: leaders "lead" because they solve the coordination problem that is inherent in reaching the threshold.

When a leader is in play, each follower's belief about whether or not his contribution is critical to the creation of the good is either \( p = 1 \) or \( p = 0 \) in equilibrium:

\[
\text{prob (i is crucial | (s_i^* = 1))} = \left( \frac{p \cdot 1}{p \cdot 1 + (1 - p) \cdot 0} \right) = 1 \tag{5.6}
\]

\[
\text{prob (i is crucial | (s_i^* = 0))} = \left( \frac{p \cdot 0}{p \cdot 0 + (1 - p) \cdot 1} \right) = 0 \tag{5.7}
\]

In \( \Gamma_2 \), the leader's payoff function is common knowledge. Because the followers know that the leader is motivated to produce the good and (weakly) prefers to send exactly \( T \) contribute signals, any follower who is told to contribute believes his contribution is critical (\( p = 1 \)). Because this belief exceeds his cost term, he contributes. Each individual told to shirk believes that his contribution is superfluous (\( p = 0 \)). Because this belief is lower than his cost term, he shirks. The leader, in equilibrium, provides a simple mechanism by which to update one's beliefs over whether one's contribution is critical or not.

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contribution symmetric equilibria in which the leader's suggestions "matter" in a straightforward fashion.

Secondly, it is important to note that the leader's signal is only weakly credible. As long as all followers obey, the leader is indifferent between any signaling vector in the interval of \( \{T, N\} \). Nonetheless, as noted above, any leader who sends more than \( T \) contribute signals risks tempting would-be contributors into shirking, as at least some contributions will be superfluous. Further, a high signaling vector fails as an equilibrium because at least a subset of leader-follower strategies are not best replies due to the fact that at
As I have argued before, however, most institutional settings are characterized not by perfect confidence in the leader’s motivation, but by doubts. As in the previous chapters, I now introduce an alternative form of leader, a bad leader. Bad leaders prefer for the good in question not only to be produced, but also to be produced with the most contributions possible. From the perspective of followers, bad leaders prefer for the good to be over-provisioned. To return to our Congressional example, a bad leader would want the bill not merely to pass, but to pass unanimously, perhaps as a result of some ulterior (and from the perspective of the followers, undesirable) motive, such as personal glory or future political ambition. Followers view this desire as needlessly costly: Rather than solicit the minimum number of followers needed to provide the good, bad leaders want everyone to bear the costs, even those who are not critical to the good’s production.

More formally, let a bad leader’s payoff function be defined as $u_{pl} = f(\omega')$ where $f$ is defined as above, and $\omega'$ represents the set of possible outcomes:

$$\omega' = \begin{cases} \left( \sum_{i=1}^{N}s \right) & \text{if } (\bullet) \geq T, \\ (0) & \text{if } (\bullet) < T. \end{cases} \tag{5.8}$$

where $(\bullet)$ represents the number of contributors.

If followers knew that they were playing with a bad leader, the leader’s signals would not be credible.

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least some contributors, if given the chance, would unilaterally switch their strategies.
Proposition 5.5: Let \( \{ \sigma^*, C, S, r \} \) describe an equilibrium of \( \Gamma_2 \) with a bad leader under certainty, where \( \sigma \) denotes the number of contribute signals (\( \sigma^* = N \)), \( C \) denotes the number of contributors, \( S \) the number of shirkers, and \( r \) the probability with which all remaining followers contribute.\(^4\)

Like a good leader, a bad leader’s task is to select the number of contribute (\( s_i = 1 \)) signals to send to followers. Assume the leader selects a signal vector \( S \), in which the number of contribute signals \( (N') \) is less than \( N \) (\( N > N' > T \)). Assume that all individuals obey, and payoffs and results are revealed. The leader’s payoff in this case is \( f(N') \). Any follower \( i \) who contributes receives \( f(1-c) \), and any follower \( j \) who shirks receives \( f(1) \). Under signaling vector \( S \), leader and follower strategies fail as mutual best replies. \( \text{Ex post} \), both the leader and all \( i \) would unilaterally switch their strategies if given the opportunity. \( \text{Ex post} \), the leader would switch to sending \( N \) contribute signals. If all followers obeyed, the leader would increase her payoff to \( f(N) \). \( \text{Ex post} \), all \( i \) would have a strong incentive to unilaterally switch his strategy to \( (s_i = 0) \), as his own contribution is superfluous. Because \( 1 \) it is common knowledge that a bad leader strongly prefers to increase the level of contributions to \( N \), and \( 2 \) a follower only knows the content of his own signal, a bad leader’s signal cannot be credible, nor can it sustain an equilibrium. Absent any credible coordinating device, the equilibrium simply reverts to the no-leader game of Proposition 5.3.

\(^4\) The previous provisos are applicable here. See footnotes 1 and 2 on the limitations of proposition 5.
Proposition 5.5 describes what would happen if followers interacted with a bad leader under certainty. However, most leader-follower relationships lack this perfect knowledge (i.e., complete information). To explore the dynamic introduced by uncertainty, consider the game $\Gamma_3 = (N, L, g)$ and let $g$ denote the probability of having a good leader ($0 \leq g \leq 1$). Let $(1 - g)$ denote the probability of having a bad leader. Let $g$ be common knowledge.

**Proposition 5.6:** In $\Gamma_3$, any risk-neutral follower $i$ who receives a contribute signal will obey iff $g > c$. Any follower $j$ who receives a shirk signal will always obey.

Followers may be told to contribute or shirk. Any follower who receives a contribute signal forms the following expectation:

$$\text{Ev}(s_i = 1) = g \cdot f(1 - c) + (1 - g) \cdot f(1 - c)$$

A follower who obeys a contribute signal expects the good to be provided, given that all other followers obey. A follower who ignores a contribute signal expects

$$\text{Ev}(s_i = 0) = g \cdot (0) + (1 - g) \cdot (1).$$

Given that all other followers obey, a follower $i$ who ignores a contribute signal from a good leader expects the provision of the good to fail, as he expects
that should "Nature" draw a good leader, exactly T contribute signals will be sent.

If Nature draws a bad leader, a follower i who ignores a contribute signal expects to free ride on the successful provisioning of others. Setting the two equations equal to each other and solving for g, a follower i who receives a contribute signal will contribute only if the probability of getting a good leader is greater than the cost of contributing (g > c).

A follower j who receives a shirk signal, however, always will obey and shirk because it is always true that

\[ \text{Ev}(s_i = 0) = g \, f(1) + (1 - g) \, f(l) > \text{Ev}(s_i = 1) = g \, f(1 - c) + (1 - g) \, f(l - c) \]

Whether or not a leader is trusted and, in turn, whether or not the good is provided hinges on the leader's reputation. In environments in which the leader's reputation (i.e., g) is greater than the cost of what the leader asks of her followers, I expect the leader to be followed. In environments in which the leader's reputation is poor, relative to the cost of fulfilling a leader's request, I expect leadership to fail. In these models, leadership hinges on a leader's reputation relative to the distastefulness of a leader's request.

**Predictions**

In this section, I detail a number of predictions derived from the theoretical models. Like Chapters Three and Four, I then test these predictions in a laboratory setting.
The first prediction states that absent a leader, any group of decentralized individuals will be unlikely to provision a good on their own.

*Prediction 5.1:* Without a leader, subjects will fail to consistently provision the good.

Given both the lack of a leadership signal upon which beliefs can be modeled, as well as the fact that “innate” (i.e., ‘p”) beliefs are unobserved, it is difficult to offer a more precise prediction. All subjects have identical “cost” terms, which eliminates full contribution as an equilibrium. Subjects should either play a pure strategy of withholding their contribution, or probabilistically mix their pure strategies. The aggregate result should be a low and inconsistent rate of provision.

Of course, it is possible that a group of subjects would contain a mix of beliefs that sustained provision of the good (i.e., five subjects, for whatever reason, believe that their contribution is critical). Absent some type of coordinating mechanism, however, this seems unlikely. The strength of leadership in these games is that a leader’s signal may refine and enhance the quality of these beliefs, enabling the group to coherently act.

The second prediction turns to introducing a good leader under certainty. In this condition, followers have complete information about the leader, her motivation, and her (weakly) credible signal.

*Prediction 5.2a:* In a threshold game with a known “good” leader, the public good will be perfectly and efficiently provisioned.
Even though a good leader is only weakly credible, her signal is credible nonetheless. This should enable the followers to efficiently provision the good in every decision period. A weaker prediction relies on comparative statics. It states that, even if not perfect, the rate of provision should be higher under a known good leader than without one.

*Prediction 5.2b:* The rate of provision under a known “good” leader will be higher than the rate of provision without a leader.

The third prediction stems from Proposition 5.4 and is integral to the leader’s effectiveness in condition two.

*Prediction 5.3:* A “good” leader will choose an equilibrium signaling strategy of sending exactly T contribute signals.

The fourth prediction is also derived from Proposition 5.4. It specifies how followers should react to a known good leader in equilibrium. A good leader’s signal under certainty is (weakly) credible, and all followers have incentives to follow the leader’s suggestion. Without it, their chances of successfully provisioning the good are slight.
Prediction 5.4: Followers will obey the leader’s suggestion when they know the leader’s type with certainty.

The remaining predictions address the effect of uncertainty. General uncertainty introduced about the leader’s motivation leads to a prediction of comparative statics.

Prediction 5.5: The rate of provision under uncertainty about the leader’s type will be lower than the rate of provision under certainty.

A sixth and related prediction is derived from Proposition 5.6. It states that: when followers have a high level of confidence in having a good leader relative to the cost of contributing, followers will obey the leader’s suggestion even though they do not know the leader’s motivation with certainty. As in Chapter Three, the credibility of leaders’ signals will be a function of the range of possible payoffs and the probability associated with having each leader type.

Prediction 5.6a In a threshold game with an uncertain type of leader, followers will obey the leader’s suggestion only when the signal is credible.

The next prediction offers a more realistic version Prediction 5.6a. Subjects (as is the case with most people) may be unable to calculate precise probability thresholds in their heads. Nonetheless, they should display at least an “intuitive” reaction to the level of uncertainty in the environment.
**Prediction 5.6b:** In a threshold game with an uncertain type of leader, followers will obey the leader’s suggestion more often under higher probabilities of having a good leader than under lower probabilities.

Propositions 5.4 and 5.5 describe the different incentives that govern the behavior of good and bad leaders. Whereas good leaders (weakly) prefer $T$ followers to contribute, bad leaders do best when all $N$ followers contribute. Prediction 5.7 follows from Proposition 5.5 and applies Prediction 5.3 to bad leaders.

**Prediction 5.7:** Bad leaders will send $N$ contribution signals and zero shirk signals.

The next several sections turn toward empirically assessing these expectations. I first discuss the specifics of the experimental design and then present the results of the experimental tests.
Experimental Design\textsuperscript{5}

As in Chapter Three, the design of this chapter has two primary components. The first consists of subjects participating in three distinct decision contexts. These are labeled below as conditions of the experiment. The second component involves a series of manipulations for the experiment. These factors are discussed here.

The general experimental design is a 2x3x2 incomplete factorial design. The first factor explores the role of leadership. Accordingly, the decision settings either had a leader or did not. With no leader, all subjects in the group were required to make a color choice and to do so without cheap talk. Under the leader manipulation, the randomly-selected leader sent a private signal to each follower suggesting a color to be chosen. Unlike the single-stage coordination experiments, leaders selected no color themselves. A leader’s payoff, therefore, only was a function of what the followers chose, which, of course, the leader attempted to influence through her suggestions.

The second factor pertains to the likelihood of having a particular type of leader in the experiment. In conditions where they had a leader, subjects were told the probability that they would draw one of these types of leaders. This manipulation varied the probability of obtaining a Type W (i.e., “good”) monitor: either a Perfect probability of 1.0, High probability of .85, or a Low probability of .50.

The final factor manipulated the credibility of leaders’ suggestions. Under conditions of certainty, leadership signals always were credible. Under uncertainty, the credibility of signals was determined randomly. The credibility of leaders’ signals under

\textsuperscript{5} Details on the number of trials, subjects, experiments, and observations per condition are provided in the
uncertainty was a joint function of the payoffs and the probability associated with having each type of leader.

**Conditions**

Subjects participated in three distinct conditions in the experiment, the order of which was randomly determined throughout. Consequently, decisions are expected to be independent of the order in which the conditions were presented. In each condition, subjects made a single-shot group decision. Like the design of Chapter Three, before beginning each new condition, subjects were given new instructions and, where the new condition differed markedly from the previous, subjects were taken through an extended example.

Condition one of the experiment involved individuals playing a single-shot, eight-person, discrete public good game with a threshold. These games correspond to $\Gamma_1$ discussed above. Figure 5.1 offers an example of these games. In the example given by Figure 5.1, ‘white’ is the choice that corresponds with shirking, and ‘gray’ is the choice that corresponds with contributing. Just like $\Gamma_1$, each subject has an incentive to choose white (shirk) if less than four other subjects choose gray (i.e., three or fewer other subjects choose to contribute). The threshold of this game (as well as all others) is five. Subsequently, if exactly four others choose gray in the example of Figure 5.1, then the subject has an incentive to choose gray as well. However, if five or more other subjects choose gray, then the subject again has an incentive to shirk and choose white.

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appendix.
The numbers in the matrix represent the number of "experimental francs" that a subject could earn in the decision. Francs were converted into dollars at the end of the experiment at a fixed rate. Prior to their first decision, subjects were informed that at the end of the experiment, one decision would be randomly selected and they would be paid in cash on the basis of their franc earnings in that particular round. This procedure was implemented for two reasons. First, it provided flexibility in the amount that subjects were paid, as it was unknown how well subjects would do beforehand. Second, the procedure buttressed the impression that game consisted of a number of single-shot group decisions.

<Figure 5.1 About Here>

Condition two introduces a leader, and Figure 5.2 contains an example of a good leader's screen. Prior to seeing this screen, however, leaders are shown and asked to study an example of a follower screen. This ensures common knowledge, and provides leaders with an understanding of the incentives facing followers. In the example of Figure 5.2, white is the public good color and orange is the shirk color. The leader is charged with sending a suggested color to each follower. To do so, a leader clicks on a color box associated with each follower (designated by the follower's letter ID). After the leader has suggested a color to everyone, she clicks OK, and is asked to confirm her satisfaction with her decision. An inspection of the payoffs in Figure 5.2 reveals that this is indeed a good leader: her payoffs are flat after the threshold has been reached.
Figure 5.3 contains an example of a follower's screen in condition two. In this example, brown is the contribute color, and yellow is the shirk color. The follower’s payoffs are presented in the upper-left hand corner of each cell. The leader’s payoffs are presented in the lower-right hand corner of each cell. Monitor payoffs are included in order to ensure common knowledge about the leader’s motivation, a crucial factor in this condition. Consistent with Proposition 5.4, the monitor (a good leader) does best in this condition when any level of the good is provisioned.

Condition three is similar to the second except that two types of leaders are introduced: good and bad. The leader's type is not revealed to followers. They only know the likelihood that they have one type of leader or another. Good leaders have incentives that are identical to the leaders in condition two. Bad leaders, however, have strong incentives to solicit the maximum and an inefficient number of contributions, as discussed in Proposition 5.5. Figure 5.4 depicts a follower's screen for this condition. Followers observe two payoff matrices, each representing their payoffs as a function of their type of leader. Attached to each matrix is the probability of getting that type of leader. As before, follower payoffs always are in the upper-left corner, and monitor payoffs are in the lower-right to ensure common knowledge. Both games constitute a discrete public good game with a threshold. The important difference lies in the fact that,
as the good leader, a Type W monitor’s suggestion is credible, whereas a Type Z
monitor’s (a bad leader’s) suggestion is not.

<Figure 5.4 About Here>

Figure 5.5 contains an example of a bad leader’s screen. Like good leaders, bad
leaders send signals to each follower by clicking on a color box next to the follower’s letter
ID. The only difference is that, as seen in the franc payoffs of the cells, bad leaders have
an incentive to get all seven followers to contribute, an outcome that is inefficient for the
followers.

As with the second condition game, a leader sends signals to followers. The
problem in this setting is whether the followers can trust that signal or not. Once the
signal is sent, followers choose their colors. Choices then are revealed in the same manner
as in previous conditions. The appropriate cell is highlighted in the correct matrix for
each subject. At this point, the type of leader is revealed to all followers.

<Figure 5.5 About Here>

Results

The results of condition one serve as a baseline with which to compare the effects
of leadership. Subjects are charged with provisioning a public good without any
institutional mechanism with which to coordinate their behavior. Prediction 5.1 proposes
that subjects will fail to reliably provision the good. As Tables 5.1 and 5.2 show, the theoretical difficulty of this game is borne out by the experimental results.

Given the difficulty of precisely predicting what a mixed strategy might look like (due to the presence of unobserved beliefs), it is useful to place the results of condition one against a theoretical backdrop. Proposition 5.2 shows that full shirking is always an equilibrium in this game. The null hypothesis of Table 5.1, therefore, holds that all subjects will always shirk. Although the rate of contributions far exceeds that of this dark prediction, it is clear that subjects found provision to be an elusive goal in this condition.

Only two groups, less than six percent of the total, managed to successfully provision the good. More than 94 percent of the groups failed, providing strong support for Prediction 5.1. Interestingly, subjects did not adhere to the equilibrium described in Proposition 5.2 in which no one in the group contributes: only one group contained no contributors. Nonetheless, in most group-decisions, few subjects contribute. 91 percent of groups land somewhere between successful provision and complete shirking, causing some subjects to waste their costly contributions. Clearly, absent an ameliorative institutional mechanism, provision of the good is extremely unlikely.

Leadership Under Certainty-Condition Two
Predictions 2a-4 claim that leadership can serve an ameliorative role, particularly when the leader is "good" and followers possess complete confidence in her motivation. Prediction 5.2a asserts that groups in condition two should perfectly and efficiently provision the good, while Prediction 5.2b offers a milder claim that provision rates will be higher with a leader than without one. Prediction 5.3 proposes that leaders will adopt their equilibrium signaling strategy of asking exactly five followers to contribute and two to shirk, while Prediction 5.4 states that all followers will adhere to the leader's advice. Table 5.2 begins to assess these claims.

<Table 5.2 About Here>

Leadership is far from a panacea in this context, as Prediction 5.2a is soundly refuted. Provision rates under known good leaders are less than perfect. Indeed, only 10 percent of groups in condition two managed to successfully provision the good. Although the percentage of groups that provision the good is nearly double that produced without a leader (10.0 versus 5.3 percent), it is difficult to claim that the overall rate of contributions are higher with a leader than without a leader ($\chi^2 = 3.01$, d.f.=7, p>.75).

These results hold at the individual level as well. As shown in Table 5.3, the probability of contributing to the good in condition two is only .43. Although this represents a mild improvement over condition one (.38), it still is considerably lower than
.71, the approximate probability that would occur if each follower had an equal chance of
being asked to contribute and Prediction 5.2a was correct.⁶

<Table 5.3 About Here>

Further, leaders do not appear to adopt their equilibrium signaling strategy. As
shown in Table 5.4, in only 18 percent of the groups did leaders send five contribute
signals (the threshold) and two shirk signals. A much more common approach was to try
to convince all seven followers to contribute. Fully 44 percent of groups had leaders who
tried this approach.

<Table 5.4 About Here>

Regardless of what strategy was adopted, followers were hesitant to heed their
leaders’ suggestions. The leader was perfectly obeyed in only one group (two percent).
In 68 percent of the groups, too few (i.e., less than the threshold of five) followers were
willing to follow the leader to provision the good even if asked. As Table 5.5 shows, the
observed rate of follower acquiescence to the leader is roughly similar to the rate that
would occur if followers were flipping coins ($\chi^2 = 5.8$, d.f. = 7, p > .5). Perhaps Teddy
Roosevelt, in a moment of reflection about leadership, best summarized trying to lead in
this context when he noted that “it’s a terrible thing to look over your shoulder when you
are trying to lead- and find no one there.”

⁶ If the leader randomly selected five of the seven followers for contribution, and if all followers obeyed, the
The challenge that would face even a renown leader like Roosevelt in this setting is formidable indeed. Recall that in this context, leadership signals always are credible, but as Table 5.6 shows, leaders often are ignored. Whenever a leader asked a follower to contribute, there was only a .49 probability that the follower would oblige. Leaders fared better when asking followers to shirk. If told to free ride, followers had a .89 probability of heeding the leader’s advice. Care should be taken in interpreting these numbers, of course, because most leaders told most followers to contribute, and few followers did. Yet the picture of leadership being drawn is here not flattering: leaders, no matter what they asked of their followers, are more often ignored than obeyed.

It would be a mistake, however, to infer from these results that leaders were completely ineffectual. A more nuanced presentation is offered by Table 5.7, which shows that subjects are more likely to chip in when they were asked to do so by their leaders. A follower in condition two who is asked to contribute has a .47 probability of chipping in. Although still quite low, it is a significant improvement over the probability of chipping in when not asked to contribute: .22. A leader’s solicitation in these games does increase the likelihood of chipping in, but its impact is unlikely to push the

individual level probability of contribution would equal the probability of being selected, or .71.
followers as a group over the threshold of provision (in fact, the predicted probability
that five followers chip in, even if all are asked, is only .32).

Leaders, then, have an impact in these games, but it is too small to create a
substantively meaningful jump in the rate of provision. We are beginning to see two
emergent themes. First, followers do not trust leaders enough to heed their advice.
Second, the tools with which leaders work in these games are meager in the face of the
underlying context.

<Table 5.7 About Here>

Leadership Under Uncertainty: Condition Three

The remaining predictions address leaders and followers under uncertainty.
Surprisingly, the effect of uncertainty is weaker than anticipated. Prediction 5.5 offers
the most general statement on the role of uncertainty: it should lead to lower rates of
provision than that produced by condition two, in which leader and follower interacted
under perfect confidence of each other's motivations. As seen in Table 5.8, this
prediction is not borne out. Although 10 percent of the groups under a certain leader
were able to provision the good versus only 5.6 percent under uncertainty, the overall
conclusion of Table 5.8 is that uncertainty doesn't make much of a difference ($\chi^2 =1.26,$
d.f.=7, $p>.975$): most groups in both environments fail.

<Table 5.8 About Here>
Table 5.9 compares the likelihood of individual contributions to the public good in conditions two and three. Followers are more likely to contribute under certainty, but the differences are very slight and statistically insignificant. If asked to contribute, a subject in condition two has a .47 probability of doing so, while this probability declines to .44 in condition three. If not asked to contribute, there is a .22 probability that the subject will do so in condition three and a .20 probability that the subject will contribute spontaneously in condition three. Again, it is important to note that under both certainty and uncertainty, leaders can increase the likelihood that an individual follower contributes by merely asking him or her to do so. This is a significant and substantively intriguing effect. But it is also a weak effect. Further, the differences in contribution rates between certainty and uncertainty are substantively slight and statistically insignificant.

<Table 5.9 About Here>

Similarly, and regardless of whether they are asked to contribute or to shirk, followers in condition three are only slightly less likely to obey the leader than followers in condition two are. Followers who were asked to chip in had a predicted probability of obeying of only .44 (as opposed to .49 in condition two). In both environments, when soliciting contributions, leaders could not convince many followers to heed their counsel, and this low level of success is only moderately lower under the presence of uncertainty.

<Table 5.10 About Here>
Why this low level of provisioning the good? Let us first examine the strategies of leaders. Both good and bad leaders in condition three understood the importance of their signals. As detailed in Table 5.11, both types of leaders sent high numbers of contribute signals. More than 84 percent of groups with bad leaders received a full seven contribution signals, providing considerable support for Prediction 5.7. Good leaders, although again abstaining from their equilibrium strategy, did endeavor to convince followers to contribute, sending five or more contribute signals in more than 56 percent of the groups.

<Table 5.11 About Here>

Despite these reasonable efforts, followers turned a deaf ear. Table 5.12 compares the frequency of obedient followers in groups with and without a credible leadership signal. Prediction 5.6a receives mild support: High rates of obeying the leader are more likely in groups with leadership credibility than in those without (35.6 percent versus 18.1 percent of groups with five or more obeying the leader \( \chi^2 = 12.2 \), d.f. = 7, p < .1).

However, in both environments, many followers ignore the leader’s advice.

<Table 5.12 About Here>

A similar picture emerges from an examination of Table 5.13, which compares the rate of follower agreement with leadership signals in groups with “high” and “low” probabilities of having a good leader. Offering a glimpse at how subjects intuitively
responded to uncertainty, Table 5.13 offers a similar description to Table 5.12. Although groups with high probabilities of getting a good leader were more likely to contain a high rate of agreement (37.6 percent of groups above the threshold versus 15 percent), the differences are moderate ($\chi^2 = 7.8$, d.f. = 7, p > .25), and there are many groups in which relatively few followers heed the leader's advice.

<Table 5.13 About Here>

These dynamics are replicated at the individual level. First, credibility does increase the predicted probability of obeying the leader. A credible leader in a high probability environment has a .62 probability of being obeyed when asking a follower to contribute. A non-credible leader in the same environment has only a .46 probability of being obeyed. Second, followers also respond to the probability associated with playing with a good leader: While followers playing with a credible, high probability leader had a .62 probability of obeying, followers playing with a credible, low probability leader had a .49 probability of obeying.

<Table 5.14 About Here>

Table 5.15 presents the percentage of followers in a group who obey the leader regressed on a number of causal factors. Groups that were blessed with 1) a more certain environment, one in which the probability of having a good leader was .85, and 2) an environment in which leadership signals were credible have a predicted rate of obeying
that is over 22 percent higher than groups without these amenities have, controlling for leader behavior. Although the variable tapping leadership probability falls short of traditional significance, it stands in the correct direction and corroborates the findings of Table 5.14.

<Table 5.15 About Here>

Table 5.16 presents the percentage of followers in a group who contributed to the good as a function of a number of causal factors. Table 5.17 does the same at the individual level. Both tables tell a similar story. Groups that displayed higher rates of obeying the leader are predicted to have higher rates of contribution. Similarly, groups with a credible leader also are predicted to display higher rates of contribution. The differences between these environments, however, are slight. At the individual level, we can see that both credibility and a high probability of having a good leader increase the probability of contributing. Leadership is certainly a factor in these games, but its impact is again quite small. Faced with a difficult social dilemma, lacking high levels of follower trust, and only able to offer cheap-talk suggestions, leadership proved ineffectual, if well-intentioned.

<Table 5.16 About Here>

<Table 5.17 About Here>

Discussion
In this chapter, I have pushed the limits of the findings detailed in the coordination chapters, in which I found that leaders, wielding only cheap-talk signals, can dramatically improve the lot of followers engaged in a coordination problem. I have found that although a “suggestion” style of leadership is quite effective in coordination environments, it is insufficient in more contentious settings such as the one detailed here. Leaders were simply unable to consistently convince enough of their charges to contribute toward the public good. Able only to offer non-binding suggestions, the tools of leadership, absent follower trust, proved inadequate to the task.

I began this chapter with the story of Speaker Foley successfully leading the Democrats to pass a reconciliation bill. Although the findings of this chapter point to the potential importance of information, credibility, and leader strategy, none of these factors alone could account for Speaker Foley’s success. It seems plausible to speculate that the real source of leadership success in these environments is 1) a more diverse array of leadership options, such as the ability to sanction and reward, and/or 2) other institutional mechanisms that engender confidence and trust in leadership. Without these additional tools, it seems unlikely that leaders could enable their charges to provision a good based on the power of suggestion alone. In the next chapter I explicitly consider an additional institutional feature that may affect the formation of trust and reputations: repetition.
**Figure 5.1**
Condition One Screen

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WHITE</strong></td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>49</td>
<td>49</td>
<td>49</td>
</tr>
<tr>
<td><strong>GRAY</strong></td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
</tbody>
</table>
Figure 5.2
Good Leader Screen

Number Choosing WHITE

<p>| | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>

Number Choosing ORANGE

Suggest a Color to each Participant

A  WHITE  ORANGE  E  WHITE  ORANGE
B  WHITE  ORANGE  F  WHITE  ORANGE
C  WHITE  ORANGE  G  WHITE  ORANGE
D  WHITE  ORANGE

OK
Figure 5.3
Condition Two Follower Screen

Choose One:  | Number of Others Choosing BROWN:
---|---|---|---|---|---|---|---
| 0 | 1 | 2 | 3 | 4 | 5 | 6 |
---|---|---|---|---|---|---|---
YELLOW | 16 | 16 | 16 | 16 | 16 | 49 | 49 |
          | 16 | 16 | 16 | 16 | 16 | 40 | 40 |
BROWN  | 5  | 5  | 5  | 5  | 34 | 34 | 34 |
          | 16 | 16 | 16 | 16 | 40 | 40 | 40 |
          |     |     |     |     |  YOU | MONITOR |
          |     |     |     |     |     |  YOU |
          |     |     |     |     |     | MONITOR |
**Figure 5.4**
Condition Three Follower Screen

<table>
<thead>
<tr>
<th>Type W, p=0.85</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>GREEN</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>49</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>40</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>YELLOW</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Type Z, p=0.15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GREEN</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>49</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>40</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>YELLOW</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>40</td>
<td>55</td>
<td>70</td>
</tr>
</tbody>
</table>
Figure 5.5
Bad Leader Screen

<table>
<thead>
<tr>
<th>Your Earnings</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>40</td>
<td>55</td>
<td>70</td>
</tr>
</tbody>
</table>

Number Choosing BROWN

<table>
<thead>
<tr>
<th>Number Choosing WHITE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
</tr>
<tr>
<td>B</td>
</tr>
<tr>
<td>C</td>
</tr>
<tr>
<td>D</td>
</tr>
<tr>
<td>E</td>
</tr>
<tr>
<td>F</td>
</tr>
<tr>
<td>G</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Suggest a Color to each Participant
Table 5.1
Condition One:
Number of Contributors Per Group

<table>
<thead>
<tr>
<th>Number of Contributors in Group</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observed # of Group-Decisions</td>
<td>1</td>
<td>11</td>
<td>14</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>(% in Parentheses)</td>
<td>(2.6)</td>
<td>(28.9)</td>
<td>(36.8)</td>
<td>(15.8)</td>
<td>(10.5)</td>
<td>(5.3)</td>
<td>(0)</td>
<td>(0)</td>
<td>(0)</td>
</tr>
<tr>
<td>Expected Freq. Under Null</td>
<td>38</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>(% in Parentheses)</td>
<td>(100)</td>
<td>(0)</td>
<td>(0)</td>
<td>(0)</td>
<td>(0)</td>
<td>(0)</td>
<td>(0)</td>
<td>(0)</td>
<td>(0)</td>
</tr>
</tbody>
</table>
### Table 5.2
Conditions One and Two Compared:
Contribution Levels With and Without a Leader

<table>
<thead>
<tr>
<th>Number of Contributors in Group</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observed # of Group Decisions -</td>
<td>1</td>
<td>11</td>
<td>14</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Condition 1 (in Parentheses)</td>
<td></td>
<td>(2.6)</td>
<td>(28.9)</td>
<td>(36.8)</td>
<td>(15.8)</td>
<td>(10.5)</td>
<td>(5.3)</td>
<td>(0)</td>
<td>(0)</td>
</tr>
<tr>
<td>Observed # of Group Decisions -</td>
<td>4</td>
<td>11</td>
<td>15</td>
<td>11</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>NA</td>
</tr>
<tr>
<td>Condition 2 (in Parentheses)</td>
<td></td>
<td>(8.0)</td>
<td>(22.0)</td>
<td>(30.0)</td>
<td>(22.0)</td>
<td>(8.0)</td>
<td>(10.0)</td>
<td>(0)</td>
<td>(0)</td>
</tr>
<tr>
<td>Chi square (d.f.=7) (p&gt;.75)</td>
<td>3.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Table 5.3  
Predicted Probabilities of Contributing:  
Conditions One, Two, and Three Compared

<table>
<thead>
<tr>
<th></th>
<th>Condition One</th>
<th>Condition Two</th>
<th>Condition Three</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability of</td>
<td>.38</td>
<td>.43</td>
<td>.40</td>
</tr>
<tr>
<td>Contributing</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Table 5.4
Condition Two:
Number of Contribution Signals by Good Leaders

<table>
<thead>
<tr>
<th>Number of Contribute Signals in Group</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observed # of Group Decisions (in Parentheses)</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>7</td>
<td>9</td>
<td>4</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>(8.0)</td>
<td>(2.0)</td>
<td>(2.0)</td>
<td>(4.0)</td>
<td>(14.0)</td>
<td>(18.0)</td>
<td>(8.0)</td>
<td>(44.0)</td>
</tr>
</tbody>
</table>
Table 5.5
Condition Two:
Group Congruence with Leadership Signals Under Certainty

<table>
<thead>
<tr>
<th>Number of Followers in Group Matching Leader's Signal</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observed Frequencies (%) in Parentheses</td>
<td>0</td>
<td>5</td>
<td>7</td>
<td>15</td>
<td>7</td>
<td>12</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Expected Frequencies Under Null (%) in Parentheses</td>
<td>.4</td>
<td>2.8</td>
<td>8.15</td>
<td>13.8</td>
<td>13.8</td>
<td>8.15</td>
<td>2.8</td>
<td>.4</td>
</tr>
<tr>
<td>Chi square (d.f.=7) (p&gt;.5)</td>
<td>5.8</td>
<td>(5.6)</td>
<td>(27.6)</td>
<td>(27.6)</td>
<td>(16.3)</td>
<td>(5.6)</td>
<td>(.8)</td>
<td></td>
</tr>
</tbody>
</table>
Table 5.6
Condition Two:
Predicted Probabilities of Obeying

<table>
<thead>
<tr>
<th>Probability of Obeying</th>
<th>Asked to Contribute</th>
<th>Not asked to Contribute</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.49</td>
<td>.89</td>
</tr>
</tbody>
</table>
### Table 5.7
**Condition Two:**
**Impact of Leadership on Predicted Probability of Contributing**

<table>
<thead>
<tr>
<th>Probability of Contributing</th>
<th>Asked to Contribute</th>
<th>Not Asked to Contribute</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.47</td>
<td>.22</td>
</tr>
</tbody>
</table>
Table 5.8  
Levels of Contribution:  
The Effects of Uncertainty on Leadership

<table>
<thead>
<tr>
<th># in Group Contributing</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observed Freq. - Leadership under uncertainty (Condition Two) (%) in Parentheses</td>
<td>4</td>
<td>11</td>
<td>15</td>
<td>11</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Observed Freq. - Leadership under uncertainty (Condition Three) (%) in Parentheses</td>
<td>5</td>
<td>8</td>
<td>11</td>
<td>7</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
| Chi square | 1.26 | (d.f.=8) | (p>.975)
Table 5.9
Predicted Probability of Contribution:
The Effect of Leadership and Uncertainty

<table>
<thead>
<tr>
<th></th>
<th>Condition Two</th>
<th>Condition Three</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asked to Contribute</td>
<td>.47</td>
<td>.44</td>
</tr>
<tr>
<td>Not Asked to Contribute</td>
<td>.22</td>
<td>.20</td>
</tr>
<tr>
<td>Predicting Probability of Obeying</td>
<td>Condition Two</td>
<td>Condition Three</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>---------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Asked to Contribute</td>
<td>.49</td>
<td>.44</td>
</tr>
<tr>
<td>Not Asked to Contribute</td>
<td>.89</td>
<td>.87</td>
</tr>
</tbody>
</table>
Table 5.11
Condition Three:
“Good” & “Bad” Leader Strategies

<table>
<thead>
<tr>
<th># of Contribute Signals sent to Group</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observed Group Frequencies: &quot;Good&quot; leaders (%) in Parentheses</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Observed Group Frequencies: &quot;Bad&quot; leaders (%) in Parentheses</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>Chi square 8.88 (d.f.=7) (p&gt;.25)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 5.12
**Condition Three:**
**Group Congruence with Leader Signal by Credibility**

<table>
<thead>
<tr>
<th># in Group Matching Leader's Signal</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observed Group Frequencies - Non-credible Signals (%) in Parentheses</td>
<td>(13.6)</td>
<td>(18.2)</td>
<td>(9.1)</td>
<td>(40.9)</td>
<td>(0)</td>
<td>(4.5)</td>
<td>(13.6)</td>
<td>(0)</td>
</tr>
<tr>
<td>Observed Group Frequencies - Credible Signals (%) in Parentheses</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Chi square</td>
<td>12.2 (d.f.=7)</td>
<td>(p&lt;.1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 5.13
Condition Three:
Group Congruence with Leadership Signals by Probability of Good Leader

<table>
<thead>
<tr>
<th># in Group Matching Leader's Signal</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observed Group Freq.: .85 probability (% in Parentheses)</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>5</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(6.3)</td>
<td>(18.8)</td>
<td>(0)</td>
<td>(31.3)</td>
<td>(6.3)</td>
<td>(18.8)</td>
<td>(12.5)</td>
<td>(6.3)</td>
</tr>
<tr>
<td>Observed Groups Freq.: .50 probability (% in Parentheses)</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>(10.0)</td>
<td>(15.0)</td>
<td>(25.0)</td>
<td>(30.0)</td>
<td>(5.0)</td>
<td>(5.0)</td>
<td>(10.0)</td>
<td>(0)</td>
</tr>
<tr>
<td>Chi square</td>
<td>7.8 (d.f.=7)</td>
<td>(p&gt;.25)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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</tbody>
</table>
Table 5.14
Condition Three:
Predicted Probabilities of Obeying the Leader
(Asked to Contribute)

<table>
<thead>
<tr>
<th></th>
<th>High Probability</th>
<th>Low Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credible</td>
<td>.62</td>
<td>.49</td>
</tr>
<tr>
<td>Not Credible</td>
<td>.46</td>
<td>.33</td>
</tr>
</tbody>
</table>
Table 5.15
Condition Three:
Determinants of Following the Leader (OLS)

<table>
<thead>
<tr>
<th>Independent variable</th>
<th>Estimate</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>.671</td>
<td>.100</td>
</tr>
<tr>
<td>% Contribute leadership signals</td>
<td>.063</td>
<td>.405</td>
</tr>
<tr>
<td>% Contribute leadership signals²</td>
<td>-.549</td>
<td>.341</td>
</tr>
<tr>
<td>High probability of good leader</td>
<td>.076</td>
<td>.061</td>
</tr>
<tr>
<td>Credible leadership signal</td>
<td>.153</td>
<td>.062</td>
</tr>
</tbody>
</table>

\[ R^2 = .621 \]
\[ F \text{ value} = 12.675 \ (p<.0001) \]
Table 5.16
Condition Three:
Determinants of Contribution Levels (OLS)

<table>
<thead>
<tr>
<th>Independent variable</th>
<th>Estimate</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-0.227</td>
<td>0.125</td>
</tr>
<tr>
<td>% Contribute leadership signals</td>
<td>-0.001</td>
<td>0.325</td>
</tr>
<tr>
<td>% Contribute leadership signals(^2)</td>
<td>0.297</td>
<td>0.285</td>
</tr>
<tr>
<td>% Followers in group obeying</td>
<td>0.654</td>
<td>0.144</td>
</tr>
<tr>
<td>High probability of good leader</td>
<td>0.005</td>
<td>0.050</td>
</tr>
<tr>
<td>Credible leadership signal</td>
<td>0.072</td>
<td>0.054</td>
</tr>
</tbody>
</table>

\[ R^2 = 0.543 \]  
F value = 7.134 (p<0.0002)
Table 5.17
Condition Three:
Predicted Probability of Contributing When Asked

<table>
<thead>
<tr>
<th></th>
<th>High Probability</th>
<th>Low Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credible</td>
<td>.52</td>
<td>.42</td>
</tr>
<tr>
<td>Not Credible</td>
<td>.32</td>
<td>.25</td>
</tr>
</tbody>
</table>
Appendix 5.1

The experiments detailed in this chapter were conducted at Texas A&M University in July of 1997. Eight groups of eight subjects each participated in 4-25 rounds (single-shot group decisions). The number of decisions per group varied as a function of both the length and nature of any additional games in which subjects participated (see Chapter Two).

The number of observations that were collected per condition are presented as follows:

<table>
<thead>
<tr>
<th></th>
<th>No Leader (Condition One)</th>
<th>Certain Leader (Condition Two)</th>
<th>P(Good Leader) = .85</th>
<th>P(Good Leader) = .50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credible</td>
<td>38</td>
<td>50</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Not Credible</td>
<td>.</td>
<td>.</td>
<td>9</td>
<td>13</td>
</tr>
</tbody>
</table>
Logit Estimates

All predicted probabilities at the individual level are derived from logit estimates, which are presented below. At the individual level, the unit of observation is a single subject’s decision in a single round. The independent variables consist of a series of variables relevant for various conditions, as well as a control variable for the round in which the decision occurred (seldom influential). Further, as both a control for and test of the assumption that the order in which conditions were presented had no bearing on the subjects’ decisions, a number of additional controls were included. These variables are a series of dummies which tap whether, in round t, a subject had experienced conditions one (Pr_co_1), two (Pr_co_2), three (Pr_co_3), or a bad leader (Pr_Bad_Lead) at any time prior to round t. The tables below show that, in general, independence of order was achieved, but there are notable exceptions.

Unless otherwise stated, all predicted probabilities assume that they occurred in round nine (the average round), and that subjects had never been exposed to any previous condition.

Model 5.1 (Relevant for Table 5.3)
Chipping under all Conditions

<table>
<thead>
<tr>
<th>Dependent Variable: Chipping In (1=yes, 0=no)</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>Pr&gt;Chi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-.791</td>
<td>.258</td>
<td>.002</td>
</tr>
<tr>
<td>Condition 2</td>
<td>.194</td>
<td>.178</td>
<td>.275</td>
</tr>
<tr>
<td>Condition 3</td>
<td>.06</td>
<td>.192</td>
<td>.756</td>
</tr>
<tr>
<td>Round</td>
<td>.034</td>
<td>.018</td>
<td>.055</td>
</tr>
<tr>
<td>Variable</td>
<td>Value 1</td>
<td>Value 2</td>
<td>Value 3</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>Pr_co_1</td>
<td>-.183</td>
<td>.252</td>
<td>.466</td>
</tr>
<tr>
<td>Pr_co_2</td>
<td>-.081</td>
<td>.263</td>
<td>.757</td>
</tr>
<tr>
<td>Pr_co_3</td>
<td>-.508</td>
<td>.260</td>
<td>.051</td>
</tr>
<tr>
<td>Pr_bad_Lead</td>
<td>.217</td>
<td>.234</td>
<td>.353</td>
</tr>
</tbody>
</table>

N=906  
Log Likelihood -546.520
Model 5.2 (Relevant for Tables 5.6 and 5.10)
Obeying under Conditions Two and Three

<table>
<thead>
<tr>
<th>Dependent Variable: Obeying the Leader (1=yes, 0=no)</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>Pr&gt;Chi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>2.116</td>
<td>.348</td>
<td>.001</td>
</tr>
<tr>
<td>Condition 3 (=1)</td>
<td>-.198</td>
<td>.187</td>
<td>.290</td>
</tr>
<tr>
<td>Asked to Contribute (1 = yes)</td>
<td>-2.134</td>
<td>.247</td>
<td>.001</td>
</tr>
<tr>
<td>Round</td>
<td>-.001</td>
<td>.022</td>
<td>.952</td>
</tr>
<tr>
<td>Pr_co_1</td>
<td>-.791</td>
<td>.363</td>
<td>.029</td>
</tr>
<tr>
<td>Pr_co_2</td>
<td>-.387</td>
<td>.327</td>
<td>.237</td>
</tr>
<tr>
<td>Pr_co_3</td>
<td>.055</td>
<td>.372</td>
<td>.882</td>
</tr>
<tr>
<td>Pr_bad_Lead</td>
<td>.803</td>
<td>.306</td>
<td>.009</td>
</tr>
</tbody>
</table>

N=602
Log Likelihood - 355.924
Model 5.3 (Relevant for Tables 5.7 and 5.9)  
Chipping in under Conditions Two and Three

<table>
<thead>
<tr>
<th>Dependent Variable: Chipping in (1=yes, 0=no)</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>Pr&gt;Chi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-1.482</td>
<td>.331</td>
<td>.001</td>
</tr>
<tr>
<td>Condition 3</td>
<td>-.131</td>
<td>.187</td>
<td>.485</td>
</tr>
<tr>
<td>Asked to Contribute</td>
<td>1.128</td>
<td>.246</td>
<td>.001</td>
</tr>
<tr>
<td>Round</td>
<td>.026</td>
<td>.022</td>
<td>.226</td>
</tr>
<tr>
<td>Pr_co_1</td>
<td>-.306</td>
<td>.365</td>
<td>.402</td>
</tr>
<tr>
<td>Pr_co_2</td>
<td>.093</td>
<td>.333</td>
<td>.780</td>
</tr>
<tr>
<td>Pr_co_3</td>
<td>-.823</td>
<td>.381</td>
<td>.031</td>
</tr>
<tr>
<td>Pr_bad_Lead</td>
<td>.640</td>
<td>.319</td>
<td>.045</td>
</tr>
</tbody>
</table>

N=602  
Log Likelihood -355.993
Model 5.4 (Relevant for Table 5.14)
Obeying under Condition Three

<table>
<thead>
<tr>
<th>Dependent Variable: Obeying the Leader (1=yes, 0=no)</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>Pr&gt;Chi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>2.021</td>
<td>.665</td>
<td>.003</td>
</tr>
<tr>
<td>Credible (1=yes)</td>
<td>.683</td>
<td>.322</td>
<td>.034</td>
</tr>
<tr>
<td>High Probability (1=yes)</td>
<td>.528</td>
<td>.308</td>
<td>.086</td>
</tr>
<tr>
<td>Asked to Contribute</td>
<td>-2.531</td>
<td>.427</td>
<td>.001</td>
</tr>
<tr>
<td>Round</td>
<td>-.022</td>
<td>.041</td>
<td>.583</td>
</tr>
<tr>
<td>Pr_co_1</td>
<td>-1.280</td>
<td>.610</td>
<td>.036</td>
</tr>
<tr>
<td>Pr_co_2</td>
<td>-.670</td>
<td>.604</td>
<td>.267</td>
</tr>
<tr>
<td>Pr_co_3</td>
<td>.814</td>
<td>.624</td>
<td>.192</td>
</tr>
<tr>
<td>Pr_bad_Lead</td>
<td>.744</td>
<td>.456</td>
<td>.103</td>
</tr>
</tbody>
</table>

N=252 Log Likelihood - 138.622
Model 5.5 (Relevant for Table 5.17)
Chipping in under Condition Three

<table>
<thead>
<tr>
<th>Dependent Variable: Chipping in (1=yes, 0=no)</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>Pr&gt;Chi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-1.871</td>
<td>.649</td>
<td>.004</td>
</tr>
<tr>
<td>Credible (1=yes)</td>
<td>.804</td>
<td>.310</td>
<td>.010</td>
</tr>
<tr>
<td>High Probability (1=yes)</td>
<td>.395</td>
<td>.230</td>
<td>.187</td>
</tr>
<tr>
<td>Asked to Contribute</td>
<td>.797</td>
<td>.389</td>
<td>.040</td>
</tr>
<tr>
<td>Round</td>
<td>-.006</td>
<td>.040</td>
<td>.876</td>
</tr>
<tr>
<td>Pr_co_1</td>
<td>.085</td>
<td>.610</td>
<td>.889</td>
</tr>
<tr>
<td>Pr_co_2</td>
<td>.092</td>
<td>.621</td>
<td>.882</td>
</tr>
<tr>
<td>Pr_co_3</td>
<td>-.681</td>
<td>.615</td>
<td>.268</td>
</tr>
<tr>
<td>Pr_bad_Lead</td>
<td>.470</td>
<td>.455</td>
<td>.302</td>
</tr>
</tbody>
</table>

N=252
Log Likelihood - 143.831
Chapter Six

Leaders and Followers in a Repeated VCM Game

Before further muddying the waters, it might be useful to summarize the study's findings to this point. As an institutional solution to problems of coordination and collective action, cheap-talk leadership is both effective and constrained. In environments that are characterized by single-stage coordination problems, the introduction of a leader has a dramatic impact, increasing rates of coordination by more than 60 percent. Even in this favorable context, though, leadership is not a sure-fire solution. When followers harbor doubts about the motivation of their leader, the ameliorative impact of leadership as an institutional solution declines. Moreover, when coordination problems are repeated, the effectiveness of leaders varies with another component of leaders' reputations: competence. Followers are sensitive not only to the motivation, but also to the observed behavior, of their leaders. Competent leaders are rewarded while incompetent leaders are penalized, irrespective of good intentions.

Chapter Five varied the underlying context from a coordination problem to a collective action problem. In this setting, the impact of cheap-talk leadership was severely constrained. Although leaders in this setting increased the likelihood that a single individual contributed toward the common welfare, their aggregate effect was small, and groups with a leader did not fare much better than those without one. To be sure, followers responded in predictable ways, obeying credible leaders and leaders with a strong reputation at relatively high rates. These types of leaders did have a significant
impact. No matter what strategy they employed, though, leaders often were
overwhelmed by the institutional setting: a powerful underlying social dilemma, a limited
set of leadership tools, and very few mechanisms that could nurture the formation of
trust.

In this chapter, I introduce an element with the potential to facilitate trusting
relationships: repeated interaction. As discussed in Chapter One, many theorists have
pointed to repetition as a necessary (although not sufficient) condition for reciprocal
trust. In repetition, players can formulate reputations for collective-regarding behavior.
They can reward individuals of a similar orientation, and punish those who choose to be
myopic or selfish. Moreover, they can learn about other players’ likely behavior,
accumulating information about the competence, trustworthiness, and general disposition
of their colleagues over time.

Of course the introduction of repetition may or may not make much of a
difference. Although repetition gives players the opportunity to learn about the
inclination of their colleagues, all of the same equilibria of the stage game exist for the
repeated game as well. Moreover, because the games of this chapter are finitely repeated,
many of the cooperative equilibria of infinitely repeated games are not sustainable, due to
the presence of a known endpoint and the loss of corresponding trigger strategies. If
repetition is to change the dynamic of the game, it must do so through the introduction of
trembling-hand equilibria. As shown by Kreps and Wilson (1982) and Milgrom and
Roberts (1982), finite repetition allows individuals to sustain a large set of cooperative
equilibria provided that players have small levels of doubt about the motivations of their
colleagues. Although the mechanisms of the experimental design employed here reduce the likelihood that subjects possess these doubts (i.e., it seems plausible to assume that subjects believe that the incentives facing others are largely similar to their own), the possibility of cooperation introduced by finite repetition does exist.

Repetition, even finite repetition, allows followers to learn about each other, their leader, and the nature of the game. Such learning can sustain a cooperative path, and the nature of that path, should it arise, would assume one of two forms. First, it might be of a trembling-hand form, in which players cooperate for most of the game, and then cease to cooperate as the end of the game nears. Second, it might take the form of an implicit reciprocal agreement, in which players attempt to equitably rotate who among them contributes and who shirks over time. Such an implicit agreement would be extraordinarily difficult absent leadership due to the absence of communication. It is possible, however, under a leader. A leader could systematically shift the burden of contribution among the followers, rotating the contribution requirement and shirking privilege among followers. In the analysis to follow, I will present evidence that suggests that some leaders attempted to create such an arrangement, but met with limited success.

Although finite repetition introduces the possibility of cooperation, it also contains the danger of reciprocal animosity and suspicion. If players learn that their leader is misguided or inept, or that their fellow followers are not to be trusted, rates of shirking could worsen. Both paths, the cooperative and the uncooperative (and all in-between) are possible. The purpose of this chapter, then, will be empirical. I present evidence that suggests which factors increase the likelihood of a cooperative path, and which factors
increase the likelihood of a downward spiral of mistrust. Theory suggests that both are possible. Evidence will allow us to determine which is more likely.

**Experimental Design**

The experimental design employed in this chapter is a 1x4 factorial design. It is identical to the design of Chapter Five with five important exceptions. Collectively, these changes serve to shift the underlying social dilemma from a single-shot to a repeated game.

First, subjects are not randomly assigned to a new treatment at the beginning of every decision period. Rather, a group of subjects randomly is assigned to one manipulation at the start of the experiment. Once assigned, subjects make 23 decisions within that decisional context. Throughout the 23-round experiment, all subjects know (and are repeatedly reminded of) the end-point of the game, and are aware that they will make the same decision with the same people for 23 iterations. Subjects are informed that the strategic context (i.e., their motivation) will not change during the 23 rounds. In every sense, then, the game is repeated.

Prior to their first decision, therefore, subjects are assigned to one of four conditions: Condition one is a no-leader game. Condition two presents a game with a known “good” leader and is played under complete information. Condition three presents a game of incomplete information in which the probability of having a good leader is .85.

---

1 Details on the number of experiments run, the number of observations per condition, etc., can be found in the appendix.
Condition four presents a game of incomplete information in which the probability of having a good leader is .50. Once assigned, these games are identical to the corresponding conditions of Chapter Five, except that rather than participating in several conditions, subjects participate in one condition throughout the course of the experiment.

A second important distinction from Chapter Five is that subjects are not randomly assigned to new roles (i.e. tasks) at the outset of each decision period. Rather, subjects maintain the same position throughout the experiment. The monitor, for example, in condition two is the monitor throughout the experiment, and the followers are always followers. Similarly, good leaders in the .85 condition are good leaders throughout the 23 decision periods.

One important commonality with the single-stage games, however, is that in conditions three and four, the leader’s type is revealed after the first decision has been made. This means that the leader’s type is uncertain only during the first round, and is perfectly revealed thereafter. This feature of the design would suggest that followers should react to good and bad leaders after the first round in very distinct fashions. Cooperative paths should be much more likely with the former than with the latter, and, as we will see, this proved to be the case.

The third important distinction from Chapter Five is that subjects are randomly assigned one and only one letter identification at the outset of the experiment. Player ‘A,’ for example, remains player A throughout. Because the other subjects are informed of player A’s action after each decision period, players can learn of each other’s style of play, and can form reputations for either contributing faithfully, stubbornly shirking, or
some mixture of the two. As noted above, this is a crucial component of a repeated game. If trembling-hand equilibria are to be found and sustained, or if any rotational “burden-sharing” agreement is to be reached, it is necessary for subjects to know with whom they are playing, and what they have done in the past.

The fourth distinction from Chapter Five is that leaders are always credible at the outset of the experiment, which is to say that in round one, the expected value of following the leader’s advice is higher than the expected value of ignoring the advice in equilibrium. As in Chapter Five, credibility is a function of the available payoffs, the leader’s type, and the probability associated with that type. In condition two, leaders are credible in all rounds. In conditions three and four, after the first round, followers learn the leader’s type with certainty. Unlike the single-stage games, however, followers can learn not only of the leader’s type, but also of the leader’s behavior and the corresponding consequences of following or ignoring the leader’s advice as the game unfolds.

Finally, in the experiments of this chapter, subjects accumulate francs for each decision they make over 23 periods. Unlike Chapter Five, in which one round was randomly selected and used as a basis for subject payments, subjects in the repeated VCM games were paid an amount that was determined by their total earnings over the 23-round game. Obviously, this feature is necessary for the game to be truly repeated.

Results
Condition One- The No-Leader Game

In condition one, eight subjects simultaneously and privately decide to contribute or withhold their contributions from a public good. Figure 6.1 presents the average number of contributions by round in the no-leader game. A number of observations may be made. First, the average experiment begins with a low rate of contribution that declines over time. Overall, the average number of contributions per round in this condition is only 2.07. Secondly, successful provision of the good is an extremely rare event. In only one experiment did subjects successfully provision the good, and that was achieved only once in the first round. Much like the single-stage games, where the mean rate of contribution was 2.18, successful provision of the good without a leader is very unlikely. Absent a leader, subjects could not settle upon or sustain any type of trembling-hand or rotational cooperative path. This is understandable, as to do so would have been extraordinarily difficult without communication.

<Figure 6.1 About Here>

Figure 6.2 presents the total number of contributions over 23 rounds, broken out by quartile. The mean number of contributions offered over the duration of the game was 5.99. On average, then, subjects contributed in less than a third of the rounds, meaning that most subjects were extremely cautious about offering their costly donation. Seventy-Five percent of subjects contributed eight times or less, meaning that a handful of subjects
(and one outlier in particular who contributed in all 23 rounds) attempted to carry the ball for the group. From Figure 6.1, we know that their costly contributions gained few converts.

<Figure 6.2 About Here>

A glimpse of what drives a subject’s decision to contribute is presented in Figure 6.3. Here, the probability of contributing in round t is presented as function of what occurred in round (t-1). In round (t-1), a subject either contributed to the good (labeled “Cont.”) or withheld his or her contribution (“Shirk”). Also in round (t-1), a subject’s group displayed a total number of contributions that was above average (“High”) or below (“Low”). Two trends are visible: Relative success begets more of the same, and there is a considerable amount of individual-level “stickiness” in subjects’ decisions over time.

<Figure 6.3 About Here>

A subject who contributed in a previous round (t - 1) that also displayed an above-average number of total contributions had a .55 probability of contributing in the next round (t). Contrast this number with the probability of a subject contributing who shirked in round (t -1) under similar conditions: .18, a significant difference (T = -5.04, DF = 119.5, P > .0001). Past contributors were relatively likely to remain contributors,
and past shirkers were likely to stay shirkers. This effect also can be seen when subjects were coming off of a round in which a low number of total contributions was offered. Here, previous contributors contribute again with a probability of .52, while previous shirkers do so with only a .14 probability ($T = -6.02$, $DF = 86.8$, $P > .0001$).

In addition to stickiness, subjects' decisions also were driven by the presence or absence of past success. The probability of a previous contributor contributing again if his group displayed an above average number of total contributions in the previous round is .55. If, in round $(t - 1)$, that same subject saw a lower than average number of contributions, his probability of contributing in round $t$ is .52. For shirkers, the comparison is .18 vs .14. Although these differences are not statistically significant, they are in the correct direction, and as we shall see, the "success begets success" tendency occurs even more strongly in other conditions.

In condition one, then, groups were unable to provision a good, and their contributions declined over time. Most subjects contributed rarely. Further, two trends, which will manifest themselves in other conditions as well, were evident: Past contributors were relatively likely to remain contributors, and past shirkers were likely to shirk again. Moreover, subjects were slightly more likely to contribute in round $t$ if their group enjoyed some success in round $(t - 1)$.

I use these results below as a baseline with which to compare the effects of leadership.
In these games, a leader, one who is motivated to assist the followers in provisioning a public good, begins the game by privately suggesting to each follower a course of action, which followers may choose to accept or ignore. The primary question is whether the introduction of a leader enables the followers to provision the good in a repeated setting.

Figure 6.4 suggests that the answer is 'no.' Subjects in condition two started with a low number of contributions that declined over the course of the game. Although the mean number of contributions with a leader is higher than the number without a leader (2.30 vs 2.07), the effect is statistically and substantively weak (T = -1.29, DF = 202.9, P > 20). Moreover, the rate of contributions under repetition (2.30) actually is lower than the rate of contributions in the single-stage games (2.46), suggesting that repetition hinders, rather than helps, the cause of provisioning the good.

<Figure 6.4 About Here>

Most subjects were guarded in their willingness to contribute. Figure 6.5 presents a subject's total number of contributions over the 23 rounds by quartile. An average subject contributed 7.63 times to the public good in this setting. This represents an improvement over the rate of contribution without a leader (5.99), but the difference is statistically weak (P > .20). With 75 percent of subjects contributing 10 times or less,
subjects remained cool to idea of contributing to the good throughout the course of the game.

<Figure 6.5 About Here>

Figure 6.6 shows that the two patterns of condition one, durability in strategy selection and a sensitivity to the presence or absence of past success, also are important in condition two. Subjects who contributed to a relatively successful group effort in round (t-1) had a .55 probability of contributing again in round t, while a subject who shirked in the previous round was likely to continue along the same path, with a probability of contributing of .42 (T = -2.96, DF = 458.6, P > .0033). Previous group success also was important. While a subject who contributed in round (t-1) to a relatively successful effort had a .55 probability of doing so again, the same contributor had only a .24 probability of contributing in round t if the previous round produced a below average number of total contributions (T = -5.83, DF = 174.4, P > .0001). The impact of previous success was similarly influential on shirkers: .42 for those who shirked in an above average previous round (t-1) vs .19 for those who shirked in a below average previous round (t-1) (T = -6.00, DF = 717.0, P > .0001).

<Figure 6.6 About Here>
Although decisions to contribute continued to be affected by durability and past success, they also were affected by the behavior of leaders. In spite the low number of contributions in the aggregate, leaders remained influential at the individual level. Figure 6.7 compares the probability of contributing for those who were and were not asked to do so. If a leader asked a follower to contribute, the follower did so with a .37 probability. If not asked, followers contributed with a .23 probability. A leader, then, could significantly increase the likelihood of contribution by merely suggesting that it be offered, a substantively intriguing and powerful effect (\( T = -4.70, \text{DF} = 664.4, P > .0001 \)). The power of suggestion remains present, then, even in this highly contentious setting. The problem for leaders, however, is that more often than not, few followers were willing to obey.

<Figure 6.7 About Here>

Figure 6.8 presents the average number of contribute signals (i.e., signals in which a leader suggested to a follower that he or she contribute) sent by the leader in condition two. Reflecting the threshold level, leaders averaged 5.01 contribute requests per round. Moreover, there is some evidence that leaders attempted to rotate who among the followers they solicited.

The probability of a leader asking a subject to contribute in two consecutive rounds was .77, which is roughly consistent with the probability that we would expect if leaders systematically and fairly rotated which five subjects would be sent a contribute
signal (i.e., .8). Buttressing this claim, leaders displayed a tendency to solicit from the same set of followers irrespective of whether or not these followers contributed in the previous round.

Figure 6.9 presents the probability of a follower receiving a contribute request in round t as a function of whether or not they were solicited in the previous round (Solicit = yes, No Solicit = no), and how the follower reacted to that solicitation (Cont. = contribute, No Cont. = shirk). Leaders tended to ask the same people to contribute in two consecutive rounds, regardless of whether the follower had previously heeded that suggestion or not. A follower who was solicited in round (t-1) and shirked was more likely to be solicited in round t (.76) than a follower who had not been previously solicited but contributed nonetheless (.62) (T = 2.35, DF = 90.9, P > .02). This suggests that leaders formulated a strategy of who among the followers to ask over time, and maintained this strategy irrespective of follower reaction. Leaders appeared to have tried to initiate a rotation scheme, in which followers would take turns provisioning the good. Unfortunately for leaders, followers were not always receptive.

<Figure 6.8 About Here>

<Figure 6.9 About Here>

Figure 6.10 presents the average number of followers who obeyed the leader per round over the course of the experiment. Although leaders started with an average of four
to five followers obeying, the number declined over time. Over the duration of the experiment, an average of 3.37 followers obeyed in a given round. This handicapped leaders’ attempts to enable the followers to provision the good: Even if all were asked, only about half would be willing to obey. Further, this rate of obeying is lower than the rate under the single-stage games, in which an average of 3.54 subjects obeyed. Repetition in this context usually is a hindrance, and Figure 6.11 provides further evidence of this phenomenon. Presenting the total number of rounds in which a subject obeyed over the duration of the experiment, an average subject in this experiment obeyed only 11.08 times over 23 rounds. Seventy five percent of subjects obeyed the leader 11 times or less. This meant that the probability of a leader successfully creating a rotation scheme in this context was indeed low: too few followers would listen over the course of the game for such a plan to come to fruition.

<Figure 6.10 About Here>

<Figure 6.11 About Here>

In deciding whether or not to offer the leader their trust, follower decisions again were both durable over time and sensitive to the presence or absence of past success. Figure 6.12 presents the probability of obeying the leader in round t as a function of obeying in round (t-1) (“Obey” vs “Ignore”), as well as the total number of contributions in the previous round (“High” vs “Low”). Subjects were more likely to obey in round t if
the previous round displayed an above average number of contributions than they were if
the previous round displayed a lower than average number of contributions: .61 vs .51 for
those obeyed in round (t-1) (T = -2.35, DF = 520.9, P > .02), and .41 vs .39 for those
who didn’t (T = -.50, DF = 560.2, P > .62). Subjects’ decisions also proved to be
significantly durable. For example, given a high number of past contributions, the
probability of obeying in round t is .61 for those who previously obeyed vs .41 for those
who did not (T = -4.44, DF = 462, P > .0001).

All leaders, however, were not treated alike. Of the seven leaders who
participated in condition two, two stood apart from the rest. In the first five rounds,
these leaders displayed an usually high level of “competence,” sending less than five
contribute signals (the threshold value) per round only once. The remaining five leaders
all sent less than five contribute signals per round more than once in the first five rounds.
Figure 6.13 compares the performance of these two groups: those with leaders displaying
relatively high levels of early competence and those without.

Although groups with competent leaders displayed an average contribute rate of
3.28 a round, groups without such leaders could muster only 1.91 contributions a round, a
significant difference (T = -5.45, DF = 98.0, P > .0001). Buttressing the findings of Chapter Four, in which followers proved sensitive to a leader's early performance in a repeated coordination game, followers in the present setting appeared to have reacted early, and consistently, to a leader's initial competence. Those with incompetent leaders quickly learned that the signal was unreliable, and that contributing was a lost cause. Those with competent leaders were more likely to view the leader's signal as reliable, and to offer the group their contribution. Where one finishes is often a function of where one begins, and this proved to be especially the case in this context.

In condition two, then, a number of factors drove subjects' decisions. The strategy selection of subjects continued to be durable over time and sensitive to the presence or absence of recent success or failure. Leaders proved to be influential at the individual level, significantly increasing the likelihood that followers contributed, although in the aggregate, they could not significantly increase the number of contributions. Some of difficulty facing leaders was a result of their own actions. Leaders who displayed an early and high level of competence were more successful than their less competent colleagues throughout the duration of the game.

*Conditions Three and Four - Leader and Followers under Incomplete Information*

Before discussing the results that are unique to conditions three and four, I first highlight some similarities. In the decision to contribute, success continued to lead to more success, and individual strategy selection continued to be durable in these
conditions. As shown in Figures 6.14 and 6.15, both contributors and shirkers generally were more likely to contribute in the next round if the group witnessed an above-average number of total contributions in the previous round. Additionally, past contributors were more likely to contribute again than past shirkers.

<Figure 6.14 About Here>

<Figure 6.15 About Here>

As shown in Figures 6.16 and 6.17, the impact of past success and durability in strategy selection was less clear in subjects' decisions to obey the leader. Strategies proved durable in round t when subjects saw a high number of contributions in round (t-1), but this consistency was absent if subjects saw a low number of total contribution in the previous round. Similarly, success did not always lead to more of the same. Although the pattern is weakly evident under good leaders, it is absent, and even occurs in the opposite direction in some cases under bad leaders. In sum, the impact of strategy durability and past success was stronger in conditions one and two than it was in three and four. It seems plausible to suggest that these cues (success and durability) were less salient in conditions three and four because had alternative cues on which to focus their attention, particularly the nature and strength of the leader's reputation.
Recall that in conditions three and four, subjects knew that they had a leader, but were uncertain in the first round which type of leader they had. In condition three, subjects believed that the probability that they had a good leader was .85, while in condition four they believed that the probability was .50. I expected that followers would offer the leader their initial trust in greater numbers in condition three than in condition four, and this generally is what we observe.

In round one, the average number of subjects obeying the leader in condition three was 6.17, as compared to 5.80 in condition four ($T = -0.518$, $DF = 7.4$, $P > .620$). Subjects were more likely initially to offer the leader their trust when the leader's initial reputation was higher, although the difference was not significant. Although this heightened level of trust did not translate into significantly higher levels of contribution (4.17 in condition three vs 5.00 in condition four; $T = 0.682$, $DF = 8.7$, $P > .513$), the results roughly conform with those of previous chapters: Given uncertainty, followers are more likely to obey a leader the better the leader's reputation is.

The overall effect of uncertainty, however, was counterintuitive. Under condition two in round one, an average of 4.57 followers obeyed the leader, and produced an average of 2.43 contributions. Under uncertainty, followers were both more likely to obey (6.17
under condition three and 5.8 under condition four) and to contribute (4.17 and 5.0) on average in the first round.

Why this counterintuitive pattern exists in the first round is not clear. In the single-stage VCM games, subjects were more likely to obey and contribute under certainty than under uncertainty. In repetition, the pattern reverses itself. Perhaps subjects thought that under repetition they had more time to recover the initial risk of obeying an uncertain leader, but the same logic should hold in condition two as well. The pattern remains a mystery.

After round one, the leader’s type is perfectly revealed. In rounds 2-23, subjects know with certainty the type of monitor with whom they are playing. Good leaders should be more successful at soliciting contributions and sustaining trust than bad leaders, given that after round one followers know which type of leader they have. With Figure 6.18, we can begin to assess this expectation.

<Figure 6.18 About Here>

Figure 6.18 compares the average number of contributions offered under good and bad leaders. Contributions under good leaders averaged 2.77 per round, while bad leaders were only able to sustain an average of 2.16 contribution per round ($T = 2.75$, $DF = 126.3$, $P > 007$). Figure 6.18 shows that the average number of contributions under good leaders was both higher and less volatile than it was under bad leaders, a finding that lends support to the theoretical models of Chapter Five.
Figures 6.19 and 6.20 present the distribution of contributions under good and bad leaders. Under good leaders, an average subject contributed to the good in 9.09 of 23 rounds, while under bad leaders the average fell to 6.91, a significant difference (P = .044). While 75 percent of followers under good leaders contributed 12 times or less, 75 percent of followers under bad leaders contributed nine times or less. Clearly, good leaders proved more successful at soliciting and sustaining contributions than bad leaders did.

<Figure 6.19 About Here>

<Figure 6.20 About Here>

One of the reasons this is the case is that good leaders and bad leaders behaved differently in these experiments. As Figure 6.21 shows, good leaders sent an average number of 4.61 contribute requests a round, while bad leaders sent an average of 4.74. The standard deviation in the distribution of contribute requests sent by good leaders is 2.25, while under bad leaders the standard deviation is 2.51. Clearly, good leaders were more successful at soliciting contributions than bad leaders were because followers had more reason to trust them. But perhaps an additional reason is that the behavior of good leaders was more consistent, providing followers with a signal of greater reliability.

<Figure 6.21 About Here>
Good and bad leaders also were distinct in who they targeted for contribution requests. As shown in Figures 6.21 and 6.22, both good and bad leaders were most likely to solicit followers in round t who obeyed their solicitation requests in round (t-1). The second-favorite target of bad leaders were followers who shirked in round (t-1), irrespective of what the bad leaders told them to do. The second-favorite target of good leaders, however, were followers who had not previously been solicited. It is unclear why good and bad leaders differed in this respect. Both types of leaders seemed less likely to adopt a straight rotation scheme than their colleagues in condition two were.

<Figure 6.22 About Here>

<Figure 6.23 About Here>

Figure 6.24 shows how followers reacted to the requests of good and bad leaders. Under good leaders, an average of 4.05 followers obeyed the leader in a round, while under bad leaders, the average is 3.58, a significant advantage for good leaders ($T = 1.96, DF = $, $P > .052$). As shown in Figures 6.25 and 6.26, followers also were more likely to trust good leaders over the duration of the experiment. An average follower under a good leader obeyed the leader's suggestion in 13.32 rounds, while a bad leader was obeyed in only 11.76 rounds on average ($P = .085$). Seventy-five percent of followers under a good leader obeyed in 15.25 rounds or less, while the same percentage obeyed bad leaders in
only 13 rounds or less. Clearly, followers felt more comfortable offering good leaders rather than bad leaders their trust.

<Figure 6.24 About Here>

<Figure 6.25 About Here>

<Figure 6.26 About Here>

Both good and bad leaders exercised influence, however, over a follower’s decision to contribute, although good leaders were more effective in this regard than bad leaders were. Figure 6.27 shows that when asked to contribute by a good leader, a follower had a .46 probability of contributing. If not asked, a follower spontaneously contributed with a .23 probability. Good leaders, by merely asking a follower to contribute, could significantly improve the likelihood that they do so ($T = -8.25$, $DF = 968.5$, $P > .0001$).

<Figure 6.28 About Here>

<Figure 6.29 About Here>

Bad leaders also were influential, but their impact was smaller than that of good leaders. When asked by a bad leader to contribute, followers complied with a probability
of .35. If not solicited, followers under bad leaders contributed with a .19 probability. Again, this difference is significant ($T = -3.89$, $DF = 364.4$, $P > .0001$), but good leaders could raise the probability of contribution to .46, whereas bad leaders were not nearly as influential (.35).

Leadership type, a leader's motivation perfectly revealed, was indeed important. However, not all leaders of a similar type were treated alike. Like condition two, followers proved sensitive to a second component of leadership reputation: competence. Two leaders in conditions three and two leaders in condition four arguably were more competent than their colleagues in early rounds. The two most competent leaders of condition three sent less than five contribute signals to the group in only one of the first five rounds. The two most competent leaders of condition four never sent less than five contribute signals in the first five rounds. Figures 6.29 and 6.30 compare the average number of contributions per round under competent and incompetent leaders for conditions three and four.

<Figure 6.29 About Here>

<Figure 6.30 About Here>

In condition three, the average number of contributions per round under the most competent leaders was 2.91. Under incompetent leaders, the average was 2.37 ($T = -1.55$, $DF = 30.2$, $P > .13$). The difference under condition four are even more dramatic.
Competent leaders solicited an average of 3.52 contributions a round, while incompetent leaders of condition four solicited only 2.28 contributions (T = -3.93, DF = 89.4, P > .0002). Followers, perhaps recognizing early on that the signal of competent leaders was better advice, proved much more willing to contribute throughout the course of the experiment than followers whose leaders behaved in a less than optimal fashion. Leaders in these conditions must overcome not one, but two, reputational hurdles: motivation and competence.

Summary and Discussion

I began this chapter by speculating about whether the introduction of repetition, and the potential for cooperative rotational agreements or trembling-hand equilibria, would enable leaders and followers to identify and sustain a cooperative path. It seems clear that the answer to that question is no. In most cases, the introduction of repetition decreased the chances of public good provision and contribution. Rather than sustaining cooperation, repetition appears to have provided subjects with an opportunity to learn about the game and the likely behavior of their colleagues. The lesson learned best is that contributions are generally inadvisable.

Although it failed to increase the rate of contribution, the introduction of repetition has highlighted some intriguing dynamics. First, the strategy selection of subjects was both durable over time, as well as sensitive to the presence or absence of recent success. Second, leaders do wield influence in this context, significantly raising the
probability that a follower chooses to contribute by merely offering a particular suggestion. Moreover, good leaders proved to be more effective in this regard than bad leaders, in both the rate at which they were obeyed and the number of contributions they could sustain. Unfortunately, however, the magnitude of these improvements was insufficient to overcome the underlying social dilemma.

Third, early failures are likely to bring about later failures. Followers respond favorably to high numbers of contributions in the previous round. When present, their probability of contributing and obeying often increased. The problem for leaders, however, is that initial stumbles (low numbers of contributors, failed goods, and early leadership mistakes) made these initial supporters less likely to obey or contribute. Unable to initially increase the individual probability of contributing high enough to overcome the threshold, lacking follower trust, and facing a serious social dilemma, leaders often found themselves in a cycle of failure and futility. Repetition, far from helping, seems equally likely to hurt a group of individuals engaged in a collective action problem.
Figure 6.1:

Condition One
Average Number of Contributions by Round
(standard errors in brackets)
Figure 6.2:

Condition One

Total Number of Contributions over 23 Rounds by Quartile
Figure 6.3:

Condition One: Contributing in Round \( t \) as a Function of Number of Contributions and Decision in Round \( (t-1) \)
Figure 6.4:

Condition Two
Average Number of Contributions by Round
(standard errors in brackets)
Figure 6.5:

Condition Two
Total Number of Contributions over 23 Rounds by Quartile
Figure Six:

Condition Two:
Contributing in Round \( t \) as a Function of Number of Contributions and Decision in Round \( (t-1) \)
Figure 6.7

Condition Two:
Contributing as a Function of Leadership Signal
Condition Two
Average Number of Contribution Signals by Round
Figure 6.9

Condition Two:
Asked to Contribute in Round \( t \) as a Function of Asked to Contribute and Response in Round \( (t-1) \)

![Graph showing the probability of contribution as a function of solicitation and response in the previous round](image)
Figure 6.10

Condition Two:
Average Number Obeying the Leader by Round
Figure 6.11

Condition Two:
Total Number of Rounds Obeying the Leader over 23 Rounds by Quartile
Figure 6.12

Condition Two:
Obeying the Leader in Round \( t \) as a Function of Number of Contributions and Decision to Obey in \( (t-1) \)
Figure 6.13

Condition Two:
Number of Contributions by Early Leadership Competence

![Graph showing the number of contributions by early leadership competence over rounds with data points for competent and incompetent leaders.](image)
Figure 6.14

Conditions Three and Four: Subjects with Good Leaders (Rounds 2-23)

Contributing in Round t as a Function of Number of Contributions and Decision in Round (t-1)
Figure 6.15

Condition Three and Four:
Subjects with Bad Leaders (Rounds 2-23)

Contributing in Round \( t \) as a Function of Number of Contributions and Decision in Round \( (t-1) \)
Figure 6.16

Conditions Three and Four
Subjects with Good Leaders (Rounds 2-23)

Obeying the Leader in Round $t$ as a Function of Number of Contributions and Decision to Obey in Round $(t-1)$
Figure 6.17

Conditions Three and Four
Subjects with Bad Leaders (Rounds 2-23)

Obeying the Leader in Round t as a Function of Number of Contributions and Decision to Obey in Round (t-1)
Figure 6.18

Conditions Three and Four
Rounds (2-23)

Average Number of Contributions by Round

![Graph showing average number of contributions by round for Bad Leaders and Good Leaders.](image-url)
Figure 6.19

Conditions Three and Four
Subjects with Good Leader

Average Number of Contributions over 23 Rounds by Quartile

Number Contributing over 23 Rounds

Quart. 1  Quart. 2  Quart. 3  Quart. 4
Figure 6.20

Conditions Three and Four
Subjects with Bad Leader

Average Number of Contributions over 23 Rounds by Quartile

Number of Contributions over 23 Rounds
Figure 6.21

Conditions Three and Four

Average Number of Contribution Signals per Round

- Bad Leaders
- Good Leaders

Number of Contribution Signals

Round
Figure 6.22

Conditions Three and Four
Subjects with Bad Leaders (Rounds 2-23)

Asked to Contribute in Round t as a Function of Asked to Contribute and Response in Round (t-1)
Figure 6.23

Conditions Three and Four
Subjects with Good Leaders (Rounds 2-23)

Asked to Contribute in Round $t$ as a Function of Asked to Contribute and Response in Round ($t-1$)
Figure 6.24

Conditions Three and Four (Rounds 2-23)

Average Number Obeying the Leader by Round

[Graph showing average number obeying the leader by round for Bad Leaders and Good Leaders]
Figure 6.25

Conditions Three and Four
Subjects with Good Leaders

Total Number Obeying over 23 Rounds by Quartile

<table>
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<tr>
<th>Quart. 1</th>
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Number Obeying over 23 Rounds

0  2  4  6  8  10  12  14  16  18  20  22
Figure 6.26

Conditions Three and Four
Subjects with Bad Leaders

Total Number Obeying over 23 Rounds by Quartile
Figure 6.27

Conditions Three and Four
Subjects with Good Leaders (Rounds 2-23)

Contributing as a Function of Leadership Signal
Figure 6.28

Conditions Three and Four
Subjects with Bad Leader (Rounds 2-23)

Contributing as a Function of Leadership Signal
Figure 6.29

Condition Three (High Probability)
Number of Contributions by Early Leadership Competence

- Early Competent Leader
- Early Incompetent Leader

Round

Number of Contributions
Figure 6.30

Condition Four (Low Probability)
Number of Contributions by Early Leadership Competence

[Graph showing contributions over rounds for Early Competent Leader and Early Incompetent Leader]
Appendix 6.1

The experiments detailed in this chapter were conducted at Texas A&M University in July 1997. Twenty-one groups of eight subjects participated in 23 consecutive decisions under one of four conditions. Most groups participated in one to two additional experiments apart from the one detailed here (e.g., a repeated coordination game). If so, the order in which the experiments were presented to the subjects was randomized.

The number of observations that were collected per condition are presented as follows. Each group participated in 23 decisions. Therefore, at the level of the individual decision, the data contains 69, 161, 138, and 115 observations in conditions one through four respectively. In conditions three and four, subjects played either with a good or a bad leader. Eight groups participated with a good leader, and three groups played with a bad leader.

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<td>No Leader (Condition One)</td>
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Chapter Seven

Leadership in the U.S. Senate

I have now considered the question of leadership with two complementary tools. Beginning with theoretical models and proceeding to laboratory tests, I have established that leadership in a highly constrained environment is dependent on two factors. First, constrained leadership largely is at the mercy of the underlying strategic context. In single-shot coordination games, cheap-talk leadership can be quite effective. Repeating the coordination game, however, limits a leader's impact. In collective action problems, suggestive leadership generally is ineffective on the aggregate level, although it remains influential at individual level. Unlike the coordination game, repetition in this setting slightly improves a leader's chances for success.

The second critical factor for leadership in constrained environments is the leader's reputation. In both theory and result, followers are unlikely to follow a leader about whom they have considerable doubts. I have presented evidence that reputation is an important factor in explaining leadership success and failure, that it interacts in subtle ways with the underlying strategic context, and that (in an unanticipated finding) it also is multidimensional: followers are sensitive not only to a leader's motivation but also to her revealed competence.

To this point, however, I have neglected at least one important question: To what extent are the theoretical results and experimental findings durable across space and time? Although I have established the theoretical consistency and internal validity of two important and intriguing findings concerning leaders (i.e., the importance of the underlying
strategic context and the leader’s reputation), I have not shown that these factors are important in more complicated or “noisy” institutional settings. As previously noted, game theoretic models and experimental methods offer an ideal set of tools for exploring an idea’s logical consistency and internal validity, but fall short in establishing external validity (both construct validity and the ability to temporally and spatially generalize).

It is desirable, even imperative, to supplement experimental evidence with quasi-experimental or statistical field data. If it is discovered that a set of models is robust to both experimental and field tests, the researcher can possess a reasonably high degree of confidence that not only is the theory logically consistent and causally sound, but that it is causally sound across space and time.

This chapter, the last substantive chapter of this study, turns to an initial exploration of the external validity of the theoretical models and laboratory results, in particular, an examination of leadership within the U.S. Senate. I begin with a brief overview and critique of the existent literature on Congressional leadership, arguing that although we know a great deal about the day-to-day work of Congressional leaders, we know relatively little about how, exactly, leaders in Congress actually lead. I then present the research design employed in this chapter, discussing the reasoning behind the selection of setting, data, and analysis. After presenting a number of hypotheses derived from the theoretical models and experimental results, I present the findings of the field study. As we will see, the findings offer both support and qualification to the theoretical predictions. I conclude with a discussion of this evidence, suggesting a number of reasons why the evidence is not more uniform in its support.
Congressional Leadership

Given the prestige and importance associated with positions of Congressional leadership, it is hardly surprising that Congressional leaders have been the recipients of considerable scholarly attention. Although I will not attempt an exhaustive review here, I will touch on a number of important highlights. To ease discussion, I will divide the literature on Congressional leaders into three categories: 1) the selection of leaders, 2) the activity and impact of leadership, and 3) theoretical treatments of Congressional leaders. The first literature speaks to how leaders come to office, the second to what they do when they arrive, while the third contains as series of studies that have attempted to explain their activity and impact. Our understanding of the process of Congressional leadership lags behind its reputed importance.

Leadership Selection

Considerable attention has been focused on the question of who becomes a leader in Congress and why. Many scholars have noted that the process of Congressional leadership selection has become increasingly institutionalized over time (Oleszek 1971; Nelson 1977; Peabody 1976; Canon 1989; Sinclair 1990; Brown and Peabody 1992). Nelson (1977) described this process as the "leadership ladder" (p. 923), defining it as a selection system that was consistent across multiple time periods, personalities, and parties. Leaders were promoted from within and dutifully advanced to the next rung of the hierarchy (although there were significant interparty differences in the ladder's use).
Peabody (1976), noting the historical rarity of a challenge to an heir apparent, argued that the ladder was maintained due to 1) the desirability of the positions themselves, 2) the goodwill incumbent leaders accumulated by doling out institutional favors (which served to deter potential challengers), and 3) the general valuation of leadership experience and intraparty peace.

Giving birth to another popular strand of literature, Truman (1959) argued that leaders would be "middlemen" drawn from the ideological center of the party. The evidence for Truman's seemingly sensible proposition, however, has been mixed. Hinkley (1970) and Sullivan (1975) garnered some of the strongest evidence for the middleman theory, while other scholars have produced mixed results (Sinclair 1983; Gross 1984; Loomis 1984; Posler and Rhodes 1997) or even contradicting results (Patterson 1963; Clausen and Wilcox 1987).

By far the most richly detailed component of the literature on leadership selection contains studies that document the importance of personality in leadership selection and success (Davidson 1989; Peabody 1976, 1984; Brown and Peabody 1984; 1992; Sinclair 1983; Polsby 1992; Little 1994). Scholars have documented the personal traits and abilities that appear to be favored by the rank and file members of Congress, including patience, fairness, courage, ambition, parliamentary knowledge and expertise, personal popularity, a working knowledge of the issues, a feel for the opinions of others, skills in negotiation, persuasiveness, and keen political instinct.

Scholars also have explored a wide variety of contextual, attitudinal, and behavioral characteristics that have tended to influence the leadership selection process. Among the more unique are Loomis' (1984) finding that leaders tended to express higher
levels of satisfaction with Congress as an institution, and placed greater value on specialization, cooperation, and universalism. More common are studies that document the importance of region and seniority (Nelson 1975; Peabody 1976; Sinclair 1983, 1990; Hinkley 1970; Brown and Peabody 1992). As also might be expected, party leaders frequently display higher levels of party support in roll-call voting than their non-leadership colleagues do (Peabody 1976; Sinclair 1983; Davidson 1989).

Undoubtedly, the dynamic of leadership is critically affected by the process of leadership selection (Posler and Rhodes 1997). As I have examined this connection elsewhere, and am presently interested in the role and consequence of leaders after they are selected, I will focus primarily on the behavior of leaders once in office.

Congressional Leaders—Activities and Success

Once in office, what is that leaders actually do? Leaders engage in a wide variety of duties and tasks (Sinclair 1983; 1995; Canon 1989; Peabody 1976; Rohde 1991; Wilson and Jillson 1989; Davidson 1989; Oleszek 1971). They spend a great deal of time on activities designed to maintain the daily operations of the institution. They are crucial in maintaining the committee system, not only staffing it but also in handling routine (and not so routine) transfer requests. Once staffed, leaders spend a considerable amount of time “feeding” the committee system (e.g., assigning legislation, assigning, coordinating, and monitoring the progression of omnibus bills), as well as coordinating its output (i.e., assigning rules, drawing up and revising floor schedules, procuring unanimous consent agreements, settling jurisdictional disputes, scheduling votes, handling amendments, etc.).
Leaders also have a considerable number of extra-institutional duties, including the need to represent the party to extrastitutional actors, serve as chief legislative advocates (or opponents) to the president, and espouse policies and principles that increase (or at least do not decrease) the probability that their fellow partisans retain their seats or numerical majority in the chamber.

Finally, whether it is called “keeping peace within the family,” “the strategy of inclusion,” manipulating the rules, distributing “goodies,” building coalitions, balancing factions, lobbying, cajoling, or merely distributing information, Congressional leaders spend a considerable amount of time attempting to persuade their partisans to move in a desired direction. Modern-day Congressional leaders have a considerable amount of help in this area (Sinclair 1993; 1995; Rohde 1991; Davidson 1989; Oleszek 1971; Munk 1974). Especially in the House, the number and proficiency of staff at the disposal of leaders, as well as the number of formal positions of leadership (i.e., the whip system) have expanded greatly in the post-reform era. Leadership is now a team effort (if centrally directed), with regular caucus meetings, committee chair meetings, “bullet” releases and informational mailings, and extensive staff communication, all designed to communicate the preferences and wishes of the leaders to the rank and file (and, conversely, to communicate to the former the limits and tolerances of the latter).

A crucial question for Congressional leaders is when to attempt to persuade their colleagues and when to maintain a less conspicuous role (Cox and McCubbins 1993; Rohde 1991; Sinclair 1992; 1995; Aldrich 1995; Rhode and Shepsle 1987; Cooper and Brady 1981). Although a certain-level of disagreement on this question exists within the literature, two broad themes clearly are visible. First, majority leadership is distinct from
minority leadership. Majority party leaders are charged with running the entire institution, which requires them to attend to a series of intrastitutional "public goods," such as moving the ever-present workload, and tending to institutional efficiency, reliability, and predictability. Minority party leaders are much freer to pursue narrower partisan and political interests. Indeed, some scholars have viewed the differences between majority and minority party leadership to be so stark as to largely ignore the latter (e.g., Cox and McCubbins 1993; although notable exceptions exist: see Koopman 1996).

Second, and beginning perhaps with Cooper and Brady (1981), a number of scholars have pointed to the fact that the involvement of Congressional leaders is contingent on the context of the issue, a piece of legislation, or a particular Congressional session. There is less agreement, however, over what particular components of that context are important. Aldrich (1995) points to the importance of the "instruction set" (i.e., those policies acceptable to the core of the party that are spatially distant from the status quo) as the key component in the decision to become involved. Rohde labels the decisional process as "conditional party government": leaders become involved when there exists a sufficient level of homogeneity within the party (on the importance of homogeneity for party leadership, also see Rohde and Shepsle 1987; Brady et al 1989). Sinclair (1992; 1995) adopts a loose cost-benefit analysis, arguing that leaders were permitted to become increasingly active in the 1980s because their members found it beneficial to delegate power. Additionally, Sinclair argues that leaders only engage themselves in matters of considerable complexity or controversy. Cox and McCubbins
point to the importance of the “leadership agenda,” the set of policies on which the leadership is united and interested.

While the literature has accepted the idea that context is important, it is obviously divided over the notion of what about the context, in particular, is important. Moreover, “context,” in addition to the variability in its conception, is often ill-defined or hazily operationalized (e.g., Aldrich’s instruction set), or defined with variables that are difficult to generalize beyond Congress (Sinclair’s cost-benefit discussion of parties in the 1980s). This is not without good reason. As I argue below, the context in which most bills, issues, and votes are considered is multidimensional, with homogeneity, interest, complexity, and importance all varying simultaneously in different directions for different actors.

_Theoretical Treatments of Congressional Leadership_

A number of scholars have addressed the question of leadership in an expressly theoretical vein (Cox and McCubbins 1993; Aldrich 1994; Jillson and Wilson 1994; Kiewiet and McCubbins 1991; Rohde and Shepsle 1987; Jillson and Wilson 1990; Arnold 1990). Cox and McCubbins (1993) argue that leaders are motivated to create and maintain a party label, which is conceptually equivalent to providing a public good. Aldrich (1995) argues that parties (and really, leaders) solve a number of problems for the rank-and-file, including problems of collective choice, collective action, and political ambition. Kiewiet and McCubbins (1991) argue that parties simultaneously attain the benefits of leadership while combating problems of agency through the careful screening
and selection of candidates. Arnold (1990) maintains that the rank-and-file need leaders to make Congressional decisions either visible or invisible to attentive and inattentive publics alike.

Yet, as I argued in the opening chapter, to recognize the need for leadership is not synonymous with understanding its causal process. Although the theoretical literature on Congressional leadership makes an important contribution by identifying its pareto-enhancing value, it has generally neglected to specify the exact causal mapping of leader behavior onto follower strategies. This neglect is especially unfortunate in the Congressional context, where leaders are severely constrained, and followers are ultimately independent. In these settings, it is critically important to address the causal process: Why do followers follow their leaders when they are free to chart their own paths? Why are leaders followed in some circumstances but not in others?

Several scholars have attempted to answer these questions by emphasizing leaders' abilities to monitor, reward, and sanction the rank-and-file. Calvert (1987), for example, argues that the dynamic of leadership is largely about the process of establishing a reputation for the ability to apply costly sanctions, and Cox and McCubbins (1993) argue that ability to assign committee seats and favorable rules represents a powerful set of carrots and sticks to wield. Yet several others scholars call into question the ease with which the sanction in Congress is deployed (Rohde 1991; Sinclair 1995; Brady 1988; Kiewiet and McCubbins 1991). While there is some controversy here, we know at a minimum that the application of sanctions is an extremely rare event, perhaps due to the fact that serious sanctions (i.e., the ability to hire or fire) are simply unavailable to Congressional leaders. Those sanctions that do exist are quite costly to apply.
Congressional leaders often will need today’s transgressor for tomorrow’s fight, and are hesitant to make permanent enemies. Brady (1988) concludes that “...throughout most of the House’s history, party leaders have been able only to persuade, not to force, members to vote ‘correctly.’”

In chapters Three through Six, I advanced a theoretical treatment of leadership in decentralized institutional settings such as the U.S. Congress. The models explicitly map leadership signals onto follower behavior, and produce a wide range of substantive hypotheses. In this chapter, I challenge the model’s external validity by examining leadership within the U.S. Senate. In so doing, I incorporate several of the literature’s more durable results, including the importance of a leader’s decision to become involved (i.e., the leadership agenda), the distinction between leading in the majority and leading in the minority, and the lack of a strong sanctioning mechanism.

Data and Methods

In the analysis to follow, I present evidence concerning the effect of a Senatorial leader’s suggestion on the willingness of his or her partisans to vote in a desired direction, and how that suggestion’s effectiveness systematically varies with the leader’s “type.” In this section, I set the stage by arguing that the U.S. Senate represents an ideal institutional environment in which to study constrained leaders. I then discuss in detail the data collected and the statistical models to be estimated.

I am concerned with a particular component of the leadership puzzle: The dynamic of leadership in institutional settings in which leaders have few formal powers
and followers harbor doubts about the desirability of the leader and his or her goals. For these components of the leadership puzzle, the U.S. Senate is ideal.

First, and in spite of the fact that they operate within one of the most powerful legislative bodies in the world, Senatorial leaders have very little former power (Davidson 1989; Oleszek 1971; 1996; Munk 1974; Patterson 1990; Smith 1989). Compared to their colleagues in the House, for example, Senatorial leaders are highly constrained in their ability to manipulate the rules to their advantage, and are equally limited in their ability to offer significant rewards and sanctions. Whereas leaders in the (post-reform) House have the ability to appoint a Rules Committee, from which they may expect favorable rules, such a body (and ability) is virtually absent in the Senate. Due to the presence of both strong norms and formal rules designed to protect individual Senatorial prerogative, partisan leaders in the Senate are forced to secure unanimous consent agreements to govern the business of the floor. Unanimous consent agreements, specifying the manner in which an issue or bill is to be considered, are aptly named: One objecting senator can sabotage an agreement for any number of reasons, including a desire to offer a (perhaps non-germane) amendment, extend debate, or perhaps accommodate a conflicting schedule (indeed, individual senators may place "holds" on almost any piece of floor business).

Compared to leadership in the House, Senatorial leadership is much less rule-driven, and much more "situational, personalized, and collegial" (Patterson 1990). In short, leadership in the Senate is not a far cry from the leadership of the theoretical models offered above. It is "one-on-one" leadership: persuading, pleading, and cajoling. Indeed, when one reads the Congressional Record, the percentage of time in which Senatorial leaders are doing just that, asking their colleagues to be on time, pleading that
delays be avoided, asking a senator to put aside his or her concern and support the party on a particular vote, is indeed striking. With little agenda power, and precious few carrots and sticks to wield, Senatorial leaders are left with little else. While this might be unfortunate from the perspective of the Senatorial leader, it represents an opportunity from the perspective of the institutional scholar.

The second desirable feature of the U.S. Senate for purposes of this study is its sheer heterogeneity in ideology and opinion, combined with the independence of its members. In both parties of the U.S. Senate, there exists a considerable diversity of opinion, ideology, and agenda preference. Due to the rules and norms of the Senate, these diverse individuals are generally free to vote, amend, and comment as they see fit. This diversity and independence is fertile ground for the sort of principal-agent problems contained in the theoretical models above. Indeed, when one considers that to unite his party, Minority Leader Dole in the 103rd Congress had to convince both Senator Wallop of Wyoming, a staunch conservative, and Senator Jefford of Vermont, a strong liberal, one can begin to appreciate that many senators, upon hearing Senator Dole's message, have ample reason to question the wisdom of following suit. The U.S. Senate, then, is an ideal setting in which to explore the dynamic of constrained leadership.

I began by randomly selecting a sample of 15 Senatorial roll call votes from the first session of three Congresses: 99th, 101st, and 103rd. These Congresses were chosen for a number of reasons. First, they provide variability in which party controlled the U.S. Senate. The Republicans were in the majority during the 99th Congress, while the Democrats were in charge during the 101st and 103rd. Second, the selected Congresses provide variability in who occupied the positions of leadership. My sample includes four
occupants of the top two Democratic leadership positions: Senators Byrd, Cranston, Mitchell, and Ford, and two occupants of the top Republican positions: Senators Dole and Simpson. Third, 1985, 1989, and 1993 offer variability in the nature of legislative-executive relations as well. In 1985, a Republican president, Ronald Reagan, interacted with a Republican Senate. In 1989, a different Republican President, George Bush, confronted a Democratic Senate. While in 1993, President Clinton was aided by (some say saddled) with a Democratic Senate.

The Congresses selected, then, offer variation in the specific individuals within leadership positions as well as the partisan control of the Senate and the presidency. In addition, there exists a considerable amount of diversity in the roll calls themselves. Some votes were quite obscure (e.g., in 1993, the sample includes Senator Roth’s motion to waive the Budget Act with respect to the Byrd point of order against the Roth amendment), while others were likely to be quite salient, even for the public at large (e.g., in 1989, the Senate voted on Agent Orange compensation for ill veterans).

Given this diversity of roll calls, what is the context in which the leaders in this study operate? Ideally, I would code each roll call for its congruence to the coordination or collective action problem discussed above. This would facilitate a direct comparison with my theoretical models and laboratory results. An operationalization of these two dilemmas, however, would be extraordinarily difficult. In truth, most issues and bills are a combination of the two dilemmas, possessing both problems of coordination (for those who agree) and collective action (for the party as a whole, or at least those segments of it that believe a bill is desirable if politically costly). Intertwined with this complexity are issue and bill specific considerations: Is, for example, a vote on Most Favored Nation
Status for China really a public-good issue of free trade, or a referendum on how members feel about China? No doubt, it is a mixture of the two.

Upon reading several bill histories, I concluded that many, if not most, roll calls are both problems of coordination and collective action (in addition to other social dilemmas such as 'divide the dollar'), plus an assorted array of issue-specific considerations. For purposes of this study, then, I have elected to set aside the issue of the underlying strategic context. As I have a random sample, I can be confident that, within the limits of sample size, the contexts of my sample "look like" the context of Congressional voting writ large. Instead, I focus on the impact of a leader's suggestion and type.

For every roll call in the sample, the votes of the two highest partisan leaders in each party were coded '1' for yea and '0' for nay. The two positions of leadership that were coded for both parties were the majority and minority leader, and majority and minority whip. These are the most important and durable positions of party leadership in the U.S. Senate. Although both parties have other leadership positions as well (i.e., chairs of steering committees, campaign committees, etc.), little additional insight into the dynamic of leadership would be gained by dipping lower on the leadership ladder. Once the leaders were identified and their votes coded, I then coded whether each member of the leader's party voted with the leader or against him or her.

The next task was to code the presence or absence of a leadership signal. For each roll call, I read all relevant sections of the Congressional Record, and searched The New York Times and Washington Post for evidence of specific involvement by the majority or
minority leader and majority and minority whip\textsuperscript{1}. To ensure validity, I adopted a very conservative criterion. For a leader to be coded as having signaled his partisans, it was necessary that the leader directly speak to the appropriate vote and express an opinion about it (in the \textit{Congressional Record}) or be directly quoted about the specific roll call in question (in \textit{The New York Times} and \textit{Washington Post}). As can be gleaned from Table 7.1, which presents the descriptive statistics at two levels of analysis, a Democratic leader signaled his partisans on only 20 percent of the sampled roll calls, while a Republican leader suggested a course of action on only about 27 percent of the roll calls.

\begin{table}[h]
\begin{center}
\begin{tabular}{|c|c|c|c|}
\hline
\textbf{Year} & \textbf{Cases} & \textbf{Signaled} & \textbf{Suggested} \\
\hline
1980 & 500 & 100 & 300 \\
1981 & 500 & 110 & 390 \\
\hline
\end{tabular}
\end{center}
\caption{Descriptive Statistics of Leadership Involvement}
\end{table}

Having coded leadership involvement, the next variable of theoretical interest was the leader’s “type.” To this point, type has been conceived of as a dichotomous variable, with leaders being either “good” or “bad.” In the real world, it is necessary to replace this dichotomy with a more realistic continuum. In the analysis to follow, I employ ideology as a surrogate measure for the leader’s type. Using the NOMINATE data set (Poole 1987; Poole and Daniels 1985; Poole and Rosenthal 1984; 1991), the measure for a leader’s type will be considered as the absolute distance from the leader’s (dimension one) NOMINATE score to the member’s (dimension one) NOMINATE score\textsuperscript{2}. The greater

\textsuperscript{1} The \textit{Congressional Record} was searched via the Congressional Information Service’s on-line search engine. CIS has placed the full \textit{Congressional Record} from the 99th-104th Congress on-line. The process of coding a leader’s involvement was simplified by a user-friendly feature of the server. CIS conveniently distinguishes that portion of the \textit{Congressional Record} that reports what was actually said on the floor from that inserted after the fact (only the former was used for this study). \textit{The New York Times} and \textit{Washington Post} were searched with the aid of NEXUS.

\textsuperscript{2} As discussed in Poole (1987), Poole and Daniels (1985), and Poole and Rosenthal (1984), dimension one of NOMINATE arrays members of Congress along an ideological continuum \{-1, 1\}. Lower scores
this distance, the more distinct in ideology the member is from the leader. The greater this
distance, the more likely it is that a member of the Senate will view his or her leader as
“bad.” The less this distance, the more likely it is that a member of the Senate will view
his or her leader as “good.”

Finally, and following the literature, I specify a number of control variables. First,
as leading in the majority is distinct from leading in the minority, I include a control for
majority party status. Second, and following the operationalization of Cox and
McCubbins (1993), I control for a bill’s presence or absence in the leadership agenda.
When both partisan leaders vote together, I consider the bill to be on the leadership
agenda. When the leaders split, the roll call is considered to be off the agenda.

Employing these variables, I estimated three statistical models3: Model One
estimates the number of partisans who vote with their leader using OLS regression. The
dependent variable, #FOLLOW, is simply the number of partisans who vote with their
leader on a roll call vote. SIGNAL, the variable of theoretical interest, measures whether
the leader signaled her partisans and is coded ‘1’ if the leader signaled the party on the
vote and ‘0’ if not. PPOWER, a control variable, is coded ‘1’ if the Democrats are in the
majority and ‘0’ if the Republicans are in power.

In Model Two, the probability that a bill passes is modeled as function of the
presence and content of leadership signals using LOGIT. The dependent variable, PASS,
is coded ‘1’ if the vote passed (i.e., a majority voted yea) and ‘0’ if not. Model Two

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3 Correspond to more liberal voting patterns, while higher scores correspond to more conservative voting.
Nearly all Democrats have negative scores, and nearly all Republicans have positive scores. Dimension one
of NOMINATE is an extremely powerful predictive tool, accounting for the majority of variance in
Congressional voting.
contains four independent variables. DEMYEA is coded ‘1’ if a Democratic leader signaled in favor of the measure (i.e., suggested a yea vote), and ‘0’ if not. DEMNAY is coded ‘1’ if a Democratic leader signaled against the measure (i.e., suggested a nay vote) and 0 if not. REPYEA and REPNAY are coded similarly for the signals of Republican leaders.

The third and final model shifts the level of analysis to the individual senator. Model Three estimates the probability of voting with a leader as a function of whether or not the leader offered a signal, as well as the leader’s reputation. The dependent variable, MATCH, is coded ‘1’ if voting with the leader and ‘0’ if not. REPUTATION, the first independent variable of theoretical interest, is operationalized as the absolute distance from the leader to the member on dimension one of NOMINATE. SIGNAL is coded as before, ‘1’ if the leader signaled the party on the vote and ‘0’ if not. The control variables are AGENDA, coded ‘1’ if both of the leaders in the party voted yea or nay and ‘0’ otherwise, and MAJORITY, coded ‘1’ if the member is in the majority party and ‘0’ if in the minority.

Table 7.2 lists the variables used in estimation, as well as their expected sign and significance.

<Table 7.2 About Here>

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3 Due to multicollinearity between the intercept and the variable MAJORITY, I could not include an additional control for matching the party of the president. In future projects, I plan to collect enough data for enough years where such a control will be possible.
Hypotheses

Drawing from the theoretical models of Chapters Three through Six, I derive a number of hypotheses:

_Hypothesis 7.1:_ The probability of a measure (bill, amendment, etc.) passing will be higher when either a Democratic or Republican leader signals a 'yea' vote, and lower when either a Democratic or Republican leader signals a 'nay' vote.

_Hypothesis 7.2:_ The number of senators who vote with their partisan leader will be higher when the leader signals than when the leader does not signal.

All the theoretical models predict that the introduction of a leader should increase the chances of a successful outcome for a set of followers (i.e., they should either fully coordinate or efficiently provide the good). Statistically, I expect both the DEMYEA and REPYEA variables to be positive and significant, and the DEMNAY and REPNAY variables to be negative and significant. In modeling the number of senators who follow their leaders, I predict the variable SIGNAL will be positive and significant.

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4 It was originally hypothesized that when both a party's leaders signaled, the leaders would be even more effective in persuading their colleagues than if only one leader signaled. This proved to be difficult to fully test, as double signaling did not occur for the Democrats. Although this did occur in the Republican party, results were not supportive.

I also planned to examine the leadership dynamic when a party's leaders split in the direction of their signaling, but as this occurred only once for one party, I have been forced to set aside this analysis for now.
Hypothesis 7.3: The probability of a senator voting with his or her partisan leader will be higher when the leader signals than when a leader does not signal.

Drawing from the theoretical results, I expect that a senator will be more likely to heed his or her leader's suggestion and vote with the leader when the leader signals his or her intentions than when he or she does not. Therefore, I expect the SIGNAL variable to be positive and significant.

Hypothesis 7.4: The probability of a senator voting with his or her partisan leader will be higher the closer he or she is in ideological proximity to the leader.

The variable TYPE measures the absolute distance in ideological space from the member to his or her leader. The greater this distance, the less likely it is that the member will view the leader as someone whose counsel is to be trusted. I expect TYPE to be negative and significant.

Hypothesis 7.5: The impact of a leader's behavior and type will be interactive.

I expect that there will be a significant interactive effect between TYPE and SIGNAL. Specifically, TYPE*SIGNAL should be significant and negative, reflecting the fact that if a "bad" leader, one who stands at a great ideological distance from a member signals, senators should be even less likely to follow than they would without the signal, as they now have a clear indication that the bill is of concern to a non-credible leader.
Results

Leadership in the Aggregate

Table 7.3 begins to present the results for the aggregate analysis, in which the probability of a measure passing is modeled as a function of leadership signaling. Table 7.4 presents the number of partisans matching the leader regressed on leadership behavior. Leadership behavior, measured in the aggregate, has little effect on the legislative outcome.

<Table 7.3 About Here>

<Table 7.4 About Here>

As Table 7.3 shows, the content of leaders' signals matters little for predicting passage. Yea signals did not significantly improve the likelihood of passage for either party, nor did Nay signals substantially decrease it. These findings are similar to those of Table 7.4, which show that the presence of a signal from the leader did not significantly increase or decrease the number of partisans who vote with the leader. In a finding that supports the results of the larger literature, the effect of majority status appears beneficial for both parties. PPOWER is positive and significant for Democrats, with the predicted number of senators who follow their leader rising by almost nine senators under a
Democratic majority. PPOWER is negative and significant for Republicans, who gain almost 11 senators when their party controls the chamber.

In the aggregate, then, the results presented here do not support Hypotheses 7.1 and 7.2. They do, however, comport with findings of both VCM chapters. Leaders, in the aggregate, have little effect on the outcome. To see if these results conform to the other half of VCM experimental results, in which leaders remained influential at the individual level, consider the results of Table 7.5.

*Primary Leaders*

<Table 7.5 About Here>

Table 7.5 presents the log-likelihood of voting with the Democratic primary leader (i.e., the majority leader when in the majority and the minority leader when in the minority) as a function of leadership behavior and a number of control variables. Results are much different at the individual level. SIGNAL, the variable tapping the introduction of a suggestion from the leader, falls short of significance but is negative, implying that leaders actually lower the probability of persuading a senator by actively signaling a suggestion. Hypothesis 7.3, then, is not supported in this case.

The evidence is more supportive for Hypothesis 7.4. TYPE is negative and significant, as predicted. The farther away from a Democratic leader senator are, the less likely they are to offer their leader their vote. The interaction effect, TYPE*SIGNAL, is
not significant, however, indicating that there is no interaction for the primary Democratic leader between type and signaling behavior.

In another distinction from the aggregate analysis, the log-likelihood of voting with the Democratic primary leader is actually lower under majority status, although, as we shall see, this effect is not particularly strong. Much stronger is the effect of a roll call being a part of the leadership agenda. AGENDA is positive and significant, indicating that the log-likelihood of voting with the Democratic leader is much higher when the two top leaders are united in their actions than when they are divided.

To gain a more substantive feel for these results, consider the contents of Figures 7.1-7.4, which present the predicted probabilities of supporting the leader with and without the leadership signal under a variety of different scenarios. The figures present the probability of voting with the leader on the Y-axis, broken out by the value of the TYPE variable on the X-axis (presented by quartile).

<Figure 7.1 About Here>

<Figure 7.2 About Here>

<Figure 7.3 About Here>

<Figure 7.4 About Here>
Note first that in all possible scenarios, the probability of voting with the leader is lower when the leader actually signals (although caution should be exercised here, in that the SIGNAL variable is not significant). Note secondly that by comparing Figures 7.1 and 7.2 with Figures 7.3 and 7.4, it is easy to see the power of the leadership agenda: When a vote is part of the leadership’s agenda, the probability of matching a leader is almost double the probability of voting with the leader on a vote outside of the agenda. Note also that there is little difference between majority and minority status here, although Democratic primary leaders do slightly worse at the individual level when their party is in the majority.

Why do Democratic primary leaders do slightly worse when they try to persuade their colleagues? Perhaps it is because these leaders only choose to signal when the roll-call vote is expected to be close or highly controversial, a speculation that has been offered by Sinclair (1995), among others. If so, it could be that there exists a selection bias for Democratic primary leaders in that they only choose to signal if they fear that the measure will go the wrong way, and face heightened odds when they do attempt to lobby their charges.

As Table 7.6 presents, the case is considerably different for the Republican primary leader. For the top Republican position, Hypotheses 7.3, 7.4, and 7.5 are strongly supported. The top Republican leader increases the probability of the rank-and-file supporting his or her vote by cajoling and pleading: SIGNAL is positive and significant. This ability is contingent, however, on the leader’s TYPE, which is negative and highly significant: As ideological distance increases, the probability of obeying the leader decreases. Interestingly, and supportive of Hypothesis 7.5, there is an interactive
effect between leadership type and behavior. TYPE*SIGNAL is negative and significant, suggesting that the effect of TYPE is heightened under the presence of a leadership signal. Like their Democratic counterparts, Republican leaders do better when a vote is part of the leadership agenda, as AGENDA is positive and significant. Majority status, however, has little effect, although it does raise the probability of successful leadership slightly.

Figures 7.5-7.8 present the predicted probabilities of following the Republican primary leader under a variety of conditions. The power of the AGENDA variable is readily apparent here, as is the generally inconsequential nature of majority status. But much more striking is the subtle relationship between TYPE, SIGNAL, and the probability of voting with the leader.

<Figure 7.5 About Here>

<Figure 7.6 About Here>

<Figure Seven About Here>

<Figure 7.8 About Here>

Signaling senators increases the probability that they will vote with the leader, but this relationship is highly contingent on the leader’s TYPE, the absolute ideological distance from the leader to the senator. For Republican primary leaders, signaling is most
effective when “preaching to the choir.” Throughout the first three most proximate quartiles, signaling can be an effective tool for highly constrained leaders such as these, increasing the probability of voting with a leader by as much as .11, and as little as .03. But in the final quartile, for those senators that are farthest away from the leader, signaling actually worsens a leader’s chances for success. Sometimes, this penalty is severe. For a vote on the leadership agenda under a Republican majority, a Republican primary leader can impair his chances of influencing a distant colleague by as much as .25 by signaling.

*Table 7.6 About Here*

The Republican primary leader, then, presents an interesting case. Signaling is quite effective for majority of the Republican rank-and-file, but it is wholly ineffective, even harmful, for those senators who are most likely to view the leader’s counsel with suspicion.

*Whips*

The results for the Democratic whips (majority or minority) are presented in Table 7.7. Like their primary Republican counterparts, these leaders can alter the voting behavior of their followers merely through cheap-talk leadership. SIGNAL is positive and significant. TYPE is negative and significant, indicating that the leader’s ability to persuade is mediated by the leader’s type, the absolute ideological distance from the
leader. The negative sign and strong significance for SIGNAL*TYPE suggests that leader’s ability to persuade is highly contingent on his or her reputation among the rank-and-file. Following the Democratic pattern thus far, whips’ chances for success are heightened when a roll call is on the leadership agenda, and they do slightly worse when their party controls the chamber.

<Table 7.7 About Here>

Figures 7.9-7.12 present the same information in a more substantive vein. The effects of majority status and the leadership agenda are clearly visible here, with Democratic whips enjoying more success when the vote is on the agenda, and less success when in they are in the majority. More striking is the interaction between SIGNAL, TYPE, and success. Signaling the masses is powerful strategy for these leaders, increasing the probability of a follower voting correctly by .05-.30. The effect of a signal from a Democratic whip is most effective on non-agenda votes, but remains influential in nearly all possible scenarios. Also striking is the highly contingent nature of the signal. Signaling is most effective on those who are most likely to view the leader as “good”: Democratic senators within the closest three ideological quartiles. Its effect drops off dramatically after that point, and, in fact, in the most extreme case, leaders can reduce the probability of a senator voting in a desired direction by more than .55. Preaching to the choir is again effective, and preaching to the heathens is counterproductive at best.

<Figure 7.9 About Here>
These data, when combined with the analysis on primary Republican leaders, present initial evidence for the external validity of the theoretical models. Leadership behavior clearly is influential for follower decisions, and the ability to persuade is strongly contingent on reputation and trust. Unfortunately, and like the Democratic leader, the results for Republican whips are less supportive.

As shown in Table 7.8, signals from Republican whips have no discernible impact on the voting behavior of rank-and-file Republicans. Although the TYPE variable displays the predicted significance and sign, there is no significant interaction between TYPE and SIGNAL. Like their primary counterparts, Republican whips experience greater success when the vote is on the leadership agenda, and enjoy more success when the Republicans are in the majority as well\(^5\).

\(^5\) Because the SIGNAL and TYPE*SIGNAL variables are insignificant, I present no figures for Republican whips.
Discussion

This analysis has provided considerable, albeit mixed, evidence toward establishing the external validity of the theoretical and laboratory results. Although Senatorial leadership proved ineffectual in the aggregate (Hypotheses 7.1 and 7.2), it was at times remarkably effective at the individual level. For primary Republican leaders and Democratic whips, signaling the rank-and-file is an effective strategy (Hypothesis 7.3), an important finding given the highly constrained nature of Senatorial leadership. Primary Democratic leaders, however, slightly hurt themselves by choosing to signal, while signaling proved ineffectual to harmful for Republican whips. Perhaps top Democratic leaders, faced with an often heterogeneous party, do in fact follow Sinclair’s dictum and only engage themselves on difficult or problematic legislation.

The success of all Senatorial leaders proved to be highly contingent on their reputations (Hypothesis 7.4), a finding that buttresses the validity of the laboratory results. However, not only was the behavior of the leader and her type important for follower behavior in an additive sense, but it also was important in an interactive sense as well (Hypothesis 7.5). Signaling was most effective when attempting to convince close allies, but became less effective, and even harmful, when signaling those who are most likely to view the leader’s signal with suspicion.

In the final chapter, I provide an overview and synthesis of what we have learned across theory, laboratory, and field.
Table 7.1:

Descriptive Statistics for Aggregate and Individual Level Data

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<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Median</th>
<th>Standard Deviation</th>
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<th>Maximum</th>
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<td>1</td>
<td>.48</td>
<td>0</td>
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</tr>
<tr>
<td>#FOLLOW (Democratic party)</td>
<td>41.91</td>
<td>44</td>
<td>11.67</td>
<td>15</td>
<td>56</td>
</tr>
<tr>
<td>#FOLLOW (Republican party)</td>
<td>36.27</td>
<td>39</td>
<td>10.7</td>
<td>7</td>
<td>51</td>
</tr>
<tr>
<td><strong>Individual Level:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Majority</td>
<td>.55</td>
<td>1</td>
<td>.50</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>TYPE (Primary Leader)</td>
<td>.19</td>
<td>.16</td>
<td>.16</td>
<td>0</td>
<td>.78</td>
</tr>
<tr>
<td>TYPE (Whip)</td>
<td>.21</td>
<td>.17</td>
<td>.18</td>
<td>0</td>
<td>.83</td>
</tr>
<tr>
<td>SIGNAL (Primary leader)</td>
<td>.19</td>
<td>0</td>
<td>.39</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>SIGNAL (Whip)</td>
<td>.11</td>
<td>0</td>
<td>.31</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>DOUBLESIGNAL</td>
<td>.03</td>
<td>0</td>
<td>.17</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>MATCH</td>
<td>.80</td>
<td>1</td>
<td>.40</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>(Primary leader)</td>
<td>MATCH (Whip)</td>
<td>AGENDA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>--------------</td>
<td>--------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>.81</td>
<td>.40</td>
<td>.39</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 7.2:
Summary of Variables and Expectations

<table>
<thead>
<tr>
<th>Variable</th>
<th>Expectation</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIGNAL</td>
<td>Positive</td>
</tr>
<tr>
<td>PPOWER</td>
<td>Positive (Democrats) Negative (Republicans)</td>
</tr>
<tr>
<td>DEMYEA</td>
<td>Positive</td>
</tr>
<tr>
<td>DEMNAY</td>
<td>Negative</td>
</tr>
<tr>
<td>REPYEA</td>
<td>Positive</td>
</tr>
<tr>
<td>REPNAY</td>
<td>Negative</td>
</tr>
<tr>
<td>REPUTATION</td>
<td>Negative</td>
</tr>
<tr>
<td>REPUTATION*SIGNAL</td>
<td>Negative</td>
</tr>
<tr>
<td>AGENDA</td>
<td>Positive</td>
</tr>
<tr>
<td>MAJORITY</td>
<td>Positive</td>
</tr>
</tbody>
</table>
### Table 7.3:

**Measure Passage by Content of Leadership Signal**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>ChiSquare</th>
<th>Pr&gt;Chi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>.619</td>
<td>.382</td>
<td>.263</td>
<td>.105</td>
</tr>
<tr>
<td>DEMYEA</td>
<td>-1.30</td>
<td>1.258</td>
<td>1.068</td>
<td>.301</td>
</tr>
<tr>
<td>DEMNAY</td>
<td>-.721</td>
<td>1.504</td>
<td>.230</td>
<td>.631</td>
</tr>
<tr>
<td>REPYEA</td>
<td>1.269</td>
<td>1.319</td>
<td>.927</td>
<td>.336</td>
</tr>
<tr>
<td>REPNAY</td>
<td>1.011</td>
<td>1.325</td>
<td>.582</td>
<td>.446</td>
</tr>
</tbody>
</table>

N = 44

Log Likelihood Ratio = -27.005

Note: Excludes one roll call in which the Republican leadership both signaled, but in different directions.
Table 7.4:
Number Voting with the Leader by Leadership Signal

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>T-Value</th>
<th>Prob &gt; T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Democrats:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>36.63</td>
<td>2.983</td>
<td>12.278</td>
<td>.001</td>
</tr>
<tr>
<td>SIGNAL</td>
<td>-2.484</td>
<td>4.148</td>
<td>-.599</td>
<td>.553</td>
</tr>
<tr>
<td>PPOWER</td>
<td>8.780</td>
<td>3.530</td>
<td>2.487</td>
<td>.017</td>
</tr>
<tr>
<td>R-Squared: .137</td>
<td>F-Value: 3.261</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Republicans: | | | | |
| Intercept | 43.562 | 2.620 | 16.627 | .001 |
| SIGNAL | -.606 | 3.242 | -.187 | .853 |
| PPOWER | -10.808 | 3.046 | -3.548 | .001 |
| R-Squared: .236 | F-Value: 6.318 | | | |

N = 44

Note: Excludes one roll call in which the Republican leadership both signaled, but in different directions.
Table 7.5:
Voting with the Democratic Primary Leader

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>ChiSquare</th>
<th>Pr&gt;Chi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>.720</td>
<td>.140</td>
<td>26.363</td>
<td>.001</td>
</tr>
<tr>
<td>TYPE</td>
<td>-1.663</td>
<td>.457</td>
<td>13.258</td>
<td>.001</td>
</tr>
<tr>
<td>SIGNAL</td>
<td>-.353</td>
<td>.275</td>
<td>1.649</td>
<td>.199</td>
</tr>
<tr>
<td>SIGNAL*TYPE</td>
<td>-.771</td>
<td>1.098</td>
<td>.493</td>
<td>.483</td>
</tr>
<tr>
<td>AGENDA</td>
<td>1.896</td>
<td>.131</td>
<td>208.323</td>
<td>.001</td>
</tr>
<tr>
<td>MAJORITY</td>
<td>-.295</td>
<td>.137</td>
<td>4.639</td>
<td>.031</td>
</tr>
</tbody>
</table>

N = 2,204

Log Likelihood Ratio = -944.013
Table 7.6:
Voting with the Republican Primary Leader

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>ChiSquare</th>
<th>Pr&gt;Chi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>.168</td>
<td>.164</td>
<td>1.049</td>
<td>.306</td>
</tr>
<tr>
<td>TYPE</td>
<td>-1.805</td>
<td>.367</td>
<td>24.282</td>
<td>.001</td>
</tr>
<tr>
<td>SIGNAL</td>
<td>.543</td>
<td>.239</td>
<td>5.169</td>
<td>.023</td>
</tr>
<tr>
<td>SIGNAL*TYPE</td>
<td>-2.031</td>
<td>.733</td>
<td>7.669</td>
<td>.006</td>
</tr>
<tr>
<td>AGENDA</td>
<td>1.716</td>
<td>.156</td>
<td>120.742</td>
<td>.001</td>
</tr>
<tr>
<td>MAJORITY</td>
<td>.224</td>
<td>.138</td>
<td>2.639</td>
<td>.104</td>
</tr>
</tbody>
</table>

N = 1,954

Log Likelihood Ratio = -927.809
Table 7.7:
Voting with the Democratic Whip

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>ChiSquare</th>
<th>Pr&gt;Chi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>0.882</td>
<td>0.156</td>
<td>31.802</td>
<td>0.001</td>
</tr>
<tr>
<td>TYPE</td>
<td>-2.924</td>
<td>0.309</td>
<td>89.752</td>
<td>0.001</td>
</tr>
<tr>
<td>SIGNAL</td>
<td>2.024</td>
<td>0.532</td>
<td>14.455</td>
<td>0.001</td>
</tr>
<tr>
<td>SIGNAL*TYPE</td>
<td>-6.242</td>
<td>1.441</td>
<td>18.77</td>
<td>0.001</td>
</tr>
<tr>
<td>AGENDA</td>
<td>2.152</td>
<td>0.14</td>
<td>236.732</td>
<td>0.001</td>
</tr>
<tr>
<td>MAJORITY</td>
<td>-0.361</td>
<td>0.149</td>
<td>5.897</td>
<td>0.015</td>
</tr>
</tbody>
</table>

N = 2,132

Log Likelihood Ratio = -830.702
Table 7.8:
Voting with the Republican Whip

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>ChiSquare</th>
<th>Pr&gt;Chi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>.735</td>
<td>.157</td>
<td>21.864</td>
<td>.001</td>
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<tr>
<td>TYPE</td>
<td>-1.949</td>
<td>.351</td>
<td>30.868</td>
<td>.001</td>
</tr>
<tr>
<td>SIGNAL</td>
<td>-.375</td>
<td>.270</td>
<td>1.92</td>
<td>.166</td>
</tr>
<tr>
<td>SIGNAL*TYPE</td>
<td>.836</td>
<td>.893</td>
<td>.877</td>
<td>.349</td>
</tr>
<tr>
<td>AGENDA</td>
<td>1.175</td>
<td>.153</td>
<td>59.320</td>
<td>.001</td>
</tr>
<tr>
<td>MAJORITY</td>
<td>.278</td>
<td>.137</td>
<td>4.131</td>
<td>.042</td>
</tr>
</tbody>
</table>

N = 1,954

Log-Likelihood Ratio = -941.666
Figure 7.1: Democratic Primary Leader Agenda/Democratic Majority

![Graph showing the relationship between absolute distance from leader by quartile and the probability of voting with the leader. The graph compares two scenarios: one with signaling and the other without signaling.](image-url)
Figure 7.2:
Democratic Primary Leader
No Agenda/Democratic Majority

Probability of Voicing with Leader

- **Signaling**
- **No Signaling**

Absolute Distance from Leader by Quartile
Figure 7.3:
Democratic Primary Leader
Agenda/Republican Majority

![Graph showing the probability of voting with the leader against the absolute distance from the leader by quartile for signaling and no signaling cases.](image-url)
Figure 7.4:
Democratic Primary Leader
No Agenda/Republican Majority

![Graph](image.png)
Figure 7.5:
Republican Primary Leader
Agenda/Republican Majority
Figure 7.6:
Republican Primary Leader
No Agenda/Republican Majority
Figure 7.7:
Primary Republican Leader
Agenda/Democratic Majority

![Graph showing the probability of voting with the leader against the absolute distance from the leader by quartile with two lines: one for 'Signaling' and another for 'No Signaling'.]
Figure 7.8:
Republican Primary Leader
No Agenda/Democratic Majority

![Graph showing the probability of voting with the leader vs. absolute distance from the leader by quartile. The graph compares signaling and no signaling scenarios.](graph.png)
Figure 7.9:
Democratic Whip
Agenda/Democratic Majority

![Graph showing probability of voting with leader versus absolute distance from leader by quartile, with curves labeled 'Signaling' and 'No Signaling'.]
Figure 7.10:
Democratic Whip
No Agenda/Democratic Majority

Probability of Voting with Leader

Absolute Distance from Leader by Quartile

- **Signaling**
- **No Signaling**
Figure 7.11:
Democratic Whip:
Agenda/Republican Majority

Probability of Voting with Leader

Absolute Distance from Leader by Quartile

- Signaling
- No Signaling
Figure 7.12:
Democratic Whip:
No Agenda/Republican Majority
Chapter Eight

Leaders and Followers: Tools, Context, and Trust

It is difficult to identify a social or political group, organization, or institution that does not have a leader of some kind or another. While the presence of leaders seemingly is ubiquitous, and many subfields of political science are critically reliant on some notion of leadership, we know little about how, exactly, leadership works. Our knowledge of leadership in highly decentralized institutional settings, in which leaders have few formal powers with which to compel follower behavior, is especially sparse. I began this research by asking if, how, and when successful leadership might occur in these particular types of institutions. Partial answers to these questions have emerged from game-theoretic models, laboratory experiments, and field data drawn from the U.S. Senate. Both theory and evidence suggest that effective leadership in decentralized institutional settings can happen, but it is critically reliant upon an additional set of institutional related features: the context in which it occurs, the tools of leadership that are available, and the level of trust between leader and follower.

Tools, Context and Trust

The theoretical models developed in this research have considered the process of leadership within the narrow confines that constrain real-life leaders. Across countless political and social groups, and in many institutional environments, leaders cannot force
their followers into compliance. Instead, they suggest, lobby, argue, plead, and cajole.

Departing from these models, this research has established that even this limited tool of leadership can be a powerful one, provided that it is deployed in the appropriate context, and that followers have reason to trust those who wield it.

The power of suggestion was most effective in single-stage coordination games. In this context, a leader with a reputation for being motivated to assist followers can have a dramatic impact on follower fortunes. Leadership was not omnipotent in this setting, however, despite the fact that single-stage coordination games are by far the most conducive context to a suggestion-style of leadership. Despite the favorable nature of this context, if followers had doubts about the leader's reputation, if they believed that the leader might have interests that are opposed to their own, followers withdrew their trust, and did so in lock-step with declines in the leader's reputation for motive.

Contextual shifts that would at first glance appear mild can have far-reaching and unanticipated effects on the leadership dynamic. Merely switching from a single-stage to a repeated coordination game can have a dramatic effect on how leaders, regardless of motivation, are perceived. Repetition splits the normally singular nature of reputation—motive—into two halves of a necessary whole: motive and competence. Introducing repetition into a coordination game allows followers to learn of and respond to both components of a leader's reputation. Good leaders, those who were motivated to assist followers, were identified as such and increasingly trusted, while bad leaders were ignored at an ever increasing rate. Having a good reputation for motive in this context simply is not enough. Followers also had to believe that the leader would put his or her motive to
good use. Leaders who dispensed advice that was less than wise soon were recognized by the followers as unreliable, and followers were as quick to withdraw their trust from these leaders as they were slow to offer it again.

It would seem that in attempting to assist followers engaged in a coordination problem, institutional settings must endow leaders with the ability to establish two equally important truths in the eyes of their charges. First, leaders must be able to convince followers that they are personally motivated to assist them. This must be accomplished either by the leader themselves, or through careful screening, selection, monitoring, and removal procedures. Second, institutions, either through the careful selection of leaders, or through monitoring and removal procedures, must enable leaders to prove their ability to offer sound advice. If either of these two halves of the leadership whole is missing, leaders are unlikely to have an impact, and followers are unlikely to offer the leader their trust.

The dynamic of leadership changed again when the context shifted to a problem of collective action. Here, in the case of the single-stage games, the same tool of leadership that proved so effectual in coordination problems was overcome by a host of institutional maladies: a difficult underlying social dilemma, the incentive to free ride, and the inability to establish patterns of trust or competence. Followers were sensitive to the same factors that drove the single-stage coordination games, displaying more willingness to offer the leader their trust under higher probabilities of having a good leader, and more willingness to obey credible leaders than non-credible leaders. Further, leaders were able to significantly increase the likelihood that an individual contributed to the common good
merely by requesting that he or she do so. But in the aggregate, the tools of leadership simply were overwhelmed by underlying context, and the leader’s static reputation for motive generally was not enough to convince enough of the followers to contribute to provision the good.

The impact of leaders did not improve when the context was shifted to a repeated collective action problem, although, like the repeated coordination games, the dual nature of leadership reputation was apparent. Followers again were sensitive to both components of the leader’s reputation: They were more likely to chip in and to obey good leaders as opposed to bad leaders, and they were sensitive to the presence of early leadership mistakes. Leaders who solicited contributions from too few followers in early rounds were quickly identified and ignored as unreliable cue givers. But even well-intentioned and competent leaders in this setting often were overwhelmed by the underlying context.

In contexts characterized by collective action problems, it seems likely that if leaders are to succeed, they must do so with a greater range of tools at their disposal (an issue of institutional design) or a greater capacity to inspire trust (an issue of leadership selection and distribution of information) than that which is present in the theoretical models and laboratory settings of this research. Leaders in this context must either wield the ability to sanction and reward their charges, or employ “psychological tools,” such as the ability to project desired traits such as trustworthiness, competence, etc., in order to convince their charges to contribute. This means that the institutions in which leaders
operate must either allow leaders to use these tools, or must disseminate the appropriate information about the leaders themselves.

Initial evidence from the U.S. Senate suggests that the theoretical models and laboratory results hold considerable external validity as well. Senatorial partisan leaders, perhaps the archetype of constrained leadership, were able to significantly increase the probability that a senator voted in a particular fashion merely by "asking" for their vote. In support of the theoretical models, and in a finding that is congruent with the laboratory results, Senatorial leadership was highly dependent on the reputation of the leader. Leadership is most effective when leaders preach to the choir, those who are most likely to favorably view the leader's reputation. It becomes less effective, and even counterproductive, for those who are most likely to view the leader's reputation with suspicion.

I began this research by asking if, how, and when leaders could lead in decentralized institutional settings. In theory as well as in laboratory and field analysis, the answer is that leaders can have an impact in highly constrained settings, but their influence is contingent on the tools at their disposal, the context in which they are wielded, and the level of trust that exists between leader and follower.

The influence of these factors is not merely additive, but interactive, and they should be conceptualized as such. Tools that are effective in some contexts will be completely ineffective in others. Two leaders with the same tools in the same context can experience different levels of success as a function of the level of trust that each holds in the eyes of followers.
Moreover, not only are tools, context, and trust interactive at a single-point in time, but they interact as time unfolds, and the nature of the interaction may change as time progresses. A single leader’s suggestions in a particular context may be heeded at one point in time, but ignored later as followers assess the consequences of following the leader’s advice. Trust is a fragile commodity at best, and the level of trust between leader and follower can change dramatically over time. Given trust, a leader with a particular tool can be effective in a particular context, but once this trust is lost, the same leader with the same tool is seldom effective again.

The expectation of effective leadership, or even “great” leadership, within a political institution is often high. If it is perceived to be missing, its absence is strongly decried. Yet this research suggests that effective leadership within many institutional settings is likely to be rare, or perhaps intermittent. To be effective, leaders must be fortunate enough to have a legitimate window of opportunity that is a joint function of the tools that they have at their disposal, the context in which they work, and the temporal sum of their past experience with their charges. If any of these factors is missing, either now or in the past, the chances of “great” leadership are remote.

*Directions for Future Research*

These findings should lead researchers in a number of future directions.

First, because the three factors that emerge from *Information and Leadership* are inherently variable across institutional settings, scholars would profit from a wider
range of empirical tests of the theoretical models. Although the present research has tested the models in laboratory conditions, as well as in the U.S. Senate, we know that leaders are present in economic firms, interest groups, institutions, and bureaucracies, among many other settings. Because these settings vary in systematic ways across variables of interest (i.e., more or fewer tools of leadership, higher or lower likelihood of reputation formation, etc.), the theoretical models should be subjected to a greater range of empirical scrutiny. I suspect that future empirical work, especially field work, will corroborate parts of the model, but also highlight the areas in need of refinement or extension.

Second, the theoretical models detailed above are in need of development in a number of directions. Currently, as the models are strictly game-theoretic, they are silent on the question of the “personality” of leadership. Clearly, however, a leader’s personality, or, more precisely, his or her reputation, is an important component of the leadership puzzle. Future research would do well to integrate game-theoretic models with insights from social and political psychology. Only through an effective blending of the two can we ultimately improve our understanding of the way in which leadership works in decentralized settings, where personal relationships and persuasion are the main tools at leaders’ disposal.

Finally, the models above address only one tool of leadership: the sharing of information and the offering of suggestions. However, real-world leaders do more than just talk: they occasionally reward and sanction their followers.
Especially intriguing are those leaders who employ weak punitive tools, or alternatively, leaders who refrain from using a significant amount of formal power. Future research would be wise to model leaders as institutional actors, with a diverse array of strategies. Perhaps such models would allow us to derive hypotheses concerning when leaders will employ the various tools at their disposal, and may even explain some anomalous leadership behavior: formally strong leaders who are weak, and seemingly weak leaders who are quite influential.

Viewed as an institutional mechanism, then, this research has taken an important step toward understanding leadership in decentralized settings, but there is obviously more work to be done.
Bibliography


